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Patent Litigation in the Lacquer Industry

Lacquer Manufacturers Combine to Refuse to Accept Agreement Recognizing Valadity of du Pont Patents at This Time.

SINGMASTER and BREYER, Metallurgists and Chemical Engineers, New York City, have sent out communications addressed to all who use lacquer finishes and to all who supply raw materials to the lacquer industry concerning the patent situation with respect to U. S. Letters Patents No. 1,535,438, Pitman, Reissue No. 16,803, Flaherty; No. 1,636,319, Pitman; No. 1,710,453, Hitt and No. 1,770,108, Pitman. These communications read, in part, as follows:

du Pont Sues Glidden Company on Lacquer Finish Patents

"E. I. duPont de Nemours Company of Wilmington, Del., filed suit against the Glidden Company, in the Eastern District of New York (Brooklyn) on June 18th claiming infringement of the Flaherty patent (Reissue 16,803) and the Hitt patent (1,710,453). These patents are claimed to dominate the manufacture and use as a finish of the low viscosity lacquers so widely used on automobiles, furniture, radio cabinets, etc.

"The suit was brought because the Glidden Company refused to sign the duPont lacquer license agreement which has been offered to a limited number of lacquer manufacturers. duPont's representatives have stated that similar suits would be filed against others who refuse to execute their agreement. The Jones-Dabney Company, of Louisville, Ky., have been verbally notified that they will be sued.

"A copy of the duPont lacquer license agreement is enclosed. The general acceptance of this agreement by lacquer manufacturers will obviously put duPont in a position to dictate prices and selling conditions.

Patents Claim Articles Coated with Lacquer

"Few lacquer purchasers realize that not only do the patents used in the license agreement cover the manufacture and sale of low viscosity lacquers, but that they also cover articles such as automobiles, tables, radio cabinets, etc., finished with this type of lacquer. Should the patents be held valid, there is nothing to prevent the duPont Company from demanding royalties on articles so finished and in other ways dictating how these finishes shall be used.

Suits Against Lacquer Manufacturers Actually Against All Interests Opposed to Market Control

"The present suit against the Glidden Company, and the other suits threatened by duPont representatives are directed not only against lacquer manufacturers but also against the interests of everyone who opposes market control. Every effort has been made to induce Glidden, Jones-Dabney and others who have openly opposed the proposal to accept the license agreement. If those whose interests are equally at stake fail to come forward with moral and financial support to the companies who are singled out by duPont, those companies may be forced in their own interests to a compromise which would make later resistance just so much more difficult.

"The fact that these companies have had the courage openly to oppose the plan indicates their confidence in the merits of their position and their determination to carry through. On the other hand, if the financial resources available to the defense are limited, the defense itself may suffer. The patents are weak and the evidence

of prior manufacture and sale overwhelming. On this point, see the accompanying letter.*

Trustee Fund Already Established

"A trustee fund, administered by five men whose standing and reputation in the industry is known to all, has been established. $33,000 have already been subscribed. $100,000 are needed.

"A copy of the Agreement with Lacquer Trustees is enclosed. We urge you to fill in, execute and return the Agreement promptly."

The trustees of the fund are:

Adrian D. Joyce, President, Glidden Company.
Wm. M. Rand, Vice President, Merrimac Chemical Company.
Lawrence Phillips President, Valentine & Company.
Wm. C. Dabney, Vice President, Jones-Dabney Company.
W. I. Longsworth, Secretary-General Manager, Lilly Varnish Company.

The following subscriptions to this fund have been received:

Glidden Company	$10,000
Valentine & Company	5,000
Cook Paint and Varnish Company	5,000
Jones-Dabney Company	2,500
Lilly Varnish Company	2,500
Merrimac Chemical Company	2,000
Gilbert Spruance Company	1,000
Singmaster & Breyer, for companies not wishing their names to appear	5,000

Further contributions are said to be expected from signers of Lacquer Patents Association Agreement and other cooperators, smaller lacquer manufacturers and raw material producers.

Since the foregoing circular letters were mailed, many subscriptions from lacquer manufacturers have been received by the Trustees. Among these is a subscription of $25,000 by the Hercules Powder Company.

The Trustees have held an organization meeting and W. M. Rand, of Merrimac Chemical Company, has been elected Chairman, W. I. Longsworth, of Lilly Varnish Company, Treasurer, and John P. Hubbell, of Singmaster & Breyer, Secretary to the Trustees. Due to the fact that suit has been brought against the Glidden Company by duPont, Adrian D. Joyce, one of the trustees, resigned and A. B. Nixon, General Manager of the Cellulose Division of the Hercules Powder Company, was elected in his place. Mr. Joyce resigned because he did not wish to act as trustee of a fund which may contribute money to the Glidden Company and, therefore, may be held as directing and interfering with the conduct of the suit.

The Glidden Company has retained Messrs. Pennie, Davis, Marvin & Edmonds as their attorneys, who have entire charge of the conduct of the suit and all matters connected therewith.

Valentine & Company, of New York City, have been notified by letter from the duPont Company that they are to be sued. The date of filing of the Bill of Complaint and the jurisdiction in which it will be filed is not yet known. Valentine & Company have plants and places of business in various parts of the United States, so the suit may be brought in any one of several jurisdictions.

* Accompanying this letter is an Extract From a Report from Pennie, Davis, Marvin & Edmonds, Patent Attorneys of New York, which states in its conclusion as follows:

"It is our conclusion that the Du Pont patents discussed in this report, taken either singly or as a group, are so permeated with invalidity that they can form no justifiable basis for a price control plan such as that outlined in the Du Pont licenses now being offered to lacquer manufacturers. Some of the claims are too narrow to be of interest to any one at this time, and the claims that are of interest are, in our opinion, invalid. In reaching the conclusion that these patents should not be used as an excuse for artificially raising prices to the ultimate consumer and all along the line, we have not overlooked the possibility that claim 12 of the Hitt patent may be valid. Certainly it is not of broad scope and surely it can be avoided without difficulty by changes in lacquer formulae, if, on investigation, it should be found that any one is at the present time using the formula of that claim."

Treating Steel Before Plating

Q.—We have been informed that sodium persulphate has been used for the pre-treatment of steel before plating. We were informed that this treatment—whatever it is—was used before nickel plating direct on steel, but it occurred to us that it may possibly have been used before plating the steel in an acid copper solution.

Can you give us any information on this subject?

A.—We never heard of sodium persulphate being used as a pickle or as a treatment before plating; cannot see the value of it. It would not prevent the chemical precipitation of copper from a copper sulphate solution and therefore cannot be used on steel previous to an acid copper solution. G. B. H.

Recovering Tin

Q.—We have on hand 1200 lbs. of sodium stannate in solution to which we have added considerable caustic and perborate. We would appreciate having any information you can give us in regard to recovering the tin. If possible, would like to recover the tin in metallic form.

A.—There is no economical method for recovering the tin. It can be electroplated out but the cost may be more than the returns from the metal obtained. It is possible that some detinning company would buy the solution. G. B. H.

Bismuth Solution

Q.—I have occasion to do some bismuth plating by the electro process and in order to accomplish this I am in need of a formula for the proper solution or bath. If you know of such a formula or can suggest a formula which seems to have possibilities such information or suggestion will be greatly appreciated.

A.—There is no commercial bismuth plating solution available at the present time. In the book on Electro-Analysis by Smith, there is a description of an electro-analytical method on page 97. The nature of the deposit is such that it is not recommended for ordinary electroplating, but it is suggested that this method be tried. A. K. Graham.

Paper Presented on Die Casting

In our July issue, on page 301, was published a Report of Committee B-6 on Die Cast, Metals and Alloys of the American Society for Testing Materials. We omitted to state that there was presented a paper on Lead Base and Tin Base Alloys for Die Castings, given by Fred S. Tobias, of the Newton Die Casting Company, New Haven, Conn.

Salt Cellars — Old and New

By A. FREDERIC SAUNDERS

Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

An Article, in Two Parts, on the Artistic Development of a Very Old and, at One Time, Very Important Table Utensil. Part I.—Salts from the 15th to 18th Century.

THE salt cellar, or "Saler," as it was called in very olden times, shares with some other of our modern table furnishings, a most distinguished and interesting lineage. For was not the Great-Salt one of the most important pieces of secular plate in the Middle Ages, always occupying the central position of honor when nobles gathered about the festive board, and serving to separate the lord and his principal guests from those of lower social standing? To sit at the table above the salt was a mark of distinction at all functions of high degree. These Salts, more properly termed "Standing-Salts," to better distinguish them from the small trencher salts designed for individual use, were usually conspicuous examples of fine craftsmanship and artistic taste in design, for they were the work of the best silversmiths of the period.

In very early times, Salts often took fantastic forms, such as lions, tigers, dragons, elephants, dolphins, castles, and even human figures. It was not until the middle of the 15th century that a definite shape came into general fashion, and from then on, the changes in shape and decorative style were a gradual development over a long period.

It seems safe to say that no one knows exactly when this important utensil first came into use; probably in early Roman times, but in England its artistic development has been defined, and the comparatively few examples which have survived give us much light on the subject.

Standing-Salts fall into four main classes. The earliest definite forms, dating from about the time of Henry VII (1483-1509), were hexagonal or cylindrical in shape and constricted in the middle, thus in general shape, approximately an hour glass. The Great Salts of Medieval times were always fitted with a hinged cover, locked, or chained down, for in those picturesque, but not wholly secure times, when poison was often used for taking off undesirables, the Salt Cellar was likely to be used as the receptacle of the fatal dose; hence the need for security against its contents being tampered with.

This early hour-glass form of Standing-Salts may be regarded as entirely of English design. They are now very scarce, as not more than ten examples are known to exist. Christ Church at Cambridge, England, possesses a particularly fine pair in silver-gilt, of hexagonal form, with a rose and fleur-de-lys decorative motif engraved upon the bulbous body and cover. This rare old piece dates back to about the beginning of the 18th century. (No. 1. Plate 1.)

An even older example of constricted cylindrical shape, known as the "Warden's Salt" (No. 2, Plate 1), is owned by New College, Oxford. This piece is conceded to be one of the finest and most unique articles of medieval secular plate possessed by any of the English colleges. This Great-Salt, the work of a master silversmith, was made about 1490 and its decorative features executed in

PLATE ONE

English Standing-Salts, 15th and 16th Century

No. 1.—Silver-Gilt Hexagonal Hour-Glass Salt, Made About 1500.

No. 2.—Silver-Gilt Cylindrical Hour-Glass Salt, Made Between 1475 and 1494.

No. 3.—Silver-Gilt Hexagonal Hour-Glass Salt, Made About 1490.

No. 4.—Silver-Gilt Cylindrical Salt, Elizabethan, About 1567.

the finest of repoussé chasing, is typical of the ornate Gothic style of the period. The perforated, steeple-like cover, florated cresting and delicate lace-like molding arounding the top and bottom of the spirally fluted body lends a richness and airy lightness to its design that illustrates fully the artistic and technical resources of the silversmith of that day.

Another famous hexagonal Salt of the late 15th century make is owned by Corpus Christi College, Oxford. As may be seen from the illustration (No. 3, Plate 1), this piece is of more massive proportions than either of its contemporaries described above. The body and cover are entirely covered with an intricate chased pattern in the rich florated style of the late Gothic. An elaborately carved knob composed of small figures and interlaced foliage separate the upper and lower sections of the body, and the cover is surmounted by a finely carved and chased finial, of such size, however, as to give the piece a rather top-heavy appearance. This handsome Salt was presented to the college by its founder, Bishop Foxe.

Straight sided cylindrical salts came into fashion about the middle of the 16th century. The first of the type, made during the short reign of Edward VI (1547-1553), were comparatively plain in decorative design, as the ornate Gothic had at last given way to the Renaissance and the influence of this change in style was soon reflected in the work of the silversmith as in every other branch of art. Under Elizabeth (1558-1603) Standing-Salts again became highly ornamental affairs, and of great size. A square shape now made its appearance, though this form is much scarcer than the cylindrical shape. A third type of Elizabethan origin were the so-called Steeple Salts, having a shallow domed cover supported on scroll brackets, and a steeple being surmounted above the dome as a finial in the manner of the curious and well-known steeple cups, first made at the close of 16th century. No. 5, Plate 2, illustrates a Steeple Salt of 1626.

A fine example of a cylindrical salt in silver-gilt owned by the City of Norwich, England, was made about 1567, and is thoroughly Elizabethan in every detail. The body and cover are handsomely chased in repoussé in the decorative strapwork so characteristic of the Elizabethan Style. The figure of an armored knight holding his lance and shield tops the cover. No. 4, Plate 1, pictures this piece of old time silversmithing.

So-called Bell Salts came into fashion between 1580 and 1613, but this style lasted only a few years. They were flared at the bottom, hence the name Bell Salts, and were usually built up of three tiers, with a perforated finial for pepper, a spice which came into general use about this time. Bell Salts were both plain and decorated, the latter usually chased with conventional strapwork, floral or fruit ornament, as pictured in No. 5, Plate 2. This one, of silver gilt, was made in London about 1608. Its height, including the ball feet, measures 10½ in. and the diameter at the base, about 6 in.

The Standing-Salt went out of fashion during the Puritanical days of the Commonwealth, under Cromwell (1649-1660), but its use was revived for the coronation banquet of Charles II. Plain open salts, circular, octagonal or square in shape, fitted with three on four scroll arms to hold a napkin, came into style during the reign of the second Charles (1660-1685).

This rare old style of salt cellar holds a particular interest in America, as one of them, made in London about 1629 was presented to Harvard College in 1644, eight years after that institution was founded. This Great-Salt is of silver, of spool shape, bearing some resemblance, in its outline, to the hour glass salts of earlier date. It is without cover, and the only ornamentation is in the volutes of the three arms, or brackets, which are fixed on the broad rim for the purpose of supporting a napkin. The diameter of this Harvard Salt is 6½ in. at the base, and 6 in. at the top, and stands about 3¼ in. high. A silver Salt of practically the same form, but dated 1664, is owned by Winchester College, England. This piece is shown in No. 7, Plate 2.

Various materials, such as glass, ivory and metals of less value than silver or gold were sometimes used in the making of these old time salt cellars, but perhaps the most beautiful of all, were those made in the French Faience at Oiron during the middle years of the 16th century. One of the most exquisite pieces in this new priceless Henry Deux ware (the name by which it is best known) is a Standing-Salt, pictured in No. 9, Plate 2.

The intricate decoration, a blending of late Gothic and early Renaissance, combining the interlaced crescents of Henri II and Diane de Poitiers was produced by inlaying colored clays in the slip covering the earthenware body. Plastic ornaments consisting of cherub heads, masks and scrolls also add to the richness of the design.

Trencher-Salts were at first very simple affairs of small size, usually measuring from two to three inches in diameter and circular or triangular in form. Not much attention was given to the decoration of Trencher-Salts, until the close of the 17th century, when gadrooned, and fluted styles (Fig. 8, Plate 2) came into fashion, to be followed by the more elaborate, footed, chased and delicately pierced blue-glass-lined salts of the 18th century. But more will be told about the development of the modern salt shakers in the second part of this article.

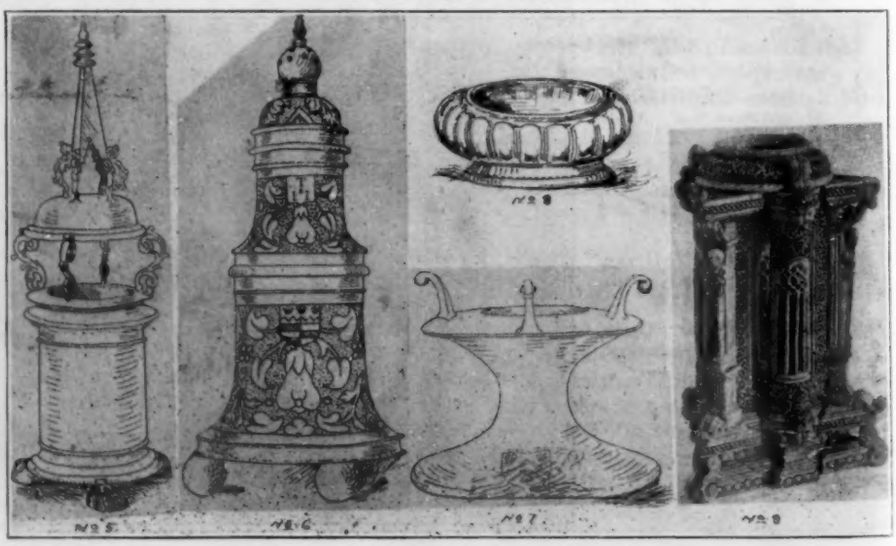

PLATE TWO

English and French Standing-Salts, 16th and 17th Century

No. 5. Silver-Gilt Steeple-Salt of 1626, Charles I.

No. 6. Silver-Gilt Bell-Salt, London, 1608, James I.

No. 7. Silver Circular, Napkin-Salt, London 1664, Charles II.

No. 8. Silver-Gilt Trencher-Salt, Fluted Design 1694.

No. 9. Standing Salt in Faience, French, Middle 16th Century.

The Chemical Effect of Gaseous Atmospheres In the Bright Annealing of Metals

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This Paper Constitutes a Part of the Work Carried On by the Committee on Industrial Gas Research of American Gas Association in the Research Laboratories of the Surface Combustion Corporation at Toledo, Ohio.

THE effects that gases have upon metal surfaces are many and varied. In many cases the metal reacts with the gaseous atmosphere in such a way as to injure the surface of the metal so that further work is necessary to restore its commercial value. The effect of the atmosphere is usually that of oxidation, whereby the metals become tarnished and in extreme cases badly scaled as a result of this action. This makes necessary a subsequent pickling operation to remove the tarnish or scale formed.

Metals vary in the way they respond to different atmospheres. For some metals the ordinary reducing atmosphere, so-called, is satisfactory and will produce a bright annealed surface. Such metals as iron and copper fall within this classification. There are other metals that are much more difficult to anneal for which it is necessary to use a special atmosphere to keep them bright during heat treatment. The metals most difficult to bright anneal are those that are alloyed with zinc. Because of its high volatility and the ease with which zinc forms the oxide, it is very difficult to anneal and keep bright. Of these metals, the so-called brasses have been studied very extensively. It is the action of various atmospheres upon brass during its heat treatment that forms the basis for much of the work reported in this paper.

The usual method of approach to the problem is to use an atmosphere that is known to be inert so that it will not react chemically with the surface of the metals being treated. Such an atmosphere is nitrogen. If a metal is heated in an atmosphere of nitrogen, particularly a metal containing zinc or one whose surface will oxidize readily, it will be found that the metal will be tarnished. This matter has been investigated very carefully in our laboratory. Pure nitrogen was obtained and further purified. The operation of heating the brass was conducted in a glass tube in a flowing atmosphere of this nitrogen. Above a temperature of 800° F. there was found to be an active staining of the metal. A bulb containing potassium hydrate KOH was used to pass the outlet gases through and by this means it was possible to detect rather large amounts of carbon dioxide in these gases.

It is a well-known fact that metals have the property of occluding various amounts of different gases that are liberated when the metal is heated. These gases, as a rule, contain carbon dioxide and in the cases of metals that are easily oxidizable, this gas, in coming from the metal, will oxidize the surface to produce a tarnish. Messrs. Leon Guillet and Albert Roux (Academie des Sciences, March, 1927) found in their study that a particular type of brass gives off, during heating in a vacuum, 55% of the volume of metal in gases; these gases containing 14.16% carbon dioxide. The problem of bright annealing brass is complicated, therefore, by the fact that it is self-oxidizing and will tarnish even when heated in an atmosphere that is chemically neutral.

When using an atmosphere of carbon monoxide for annealing brass, it is found that the following reversible reaction $2CO = C + CO_2$, takes place towards the right at the temperatures considered with the liberation of CO_2. The presence of carbon dioxide CO_2 will oxidize brass very strongly even in very small amounts. Therefore, it is not feasible from a chemical standpoint to use an atmosphere of carbon monoxide for bright annealing purposes. In the case of an iron or steel, the presence of carbon monoxide produces strong carburization of the metal when heated to a temperature above 1,500° F. For this reason also it cannot be used for annealing purposes with these metals.

In the course of these studies, it was found that metals and particularly brass could be made bright by annealing in hydrocarbon gases under some very definite conditions. The results obtained at first seemed to be very erratic. This made necessary an extended research of the factors involved. We had to study the effects that were taking place in the gas itself during the heating and also the effects upon the metal at different temperatures. It is a well known fact that the hydrocarbon gases break down with carbon deposition at different temperatures. This breakdown is affected by the presence of certain materials that will act as catalysts. In the presence of these catalysts the carbon deposition is very active at a temperature of 1,250° F., without the catalyst the temperatures are much higher. Along with the carbon deposition there is a corresponding liberation of hydrogen which is known to be very strongly reducing in its action on an oxidized metal surface. In order to bright anneal in any of these hydrocarbon gases, it was found to be necessary to break down the gas in this manner before satisfactory results could be obtained. If the operation were conducted in a silica tube or in a glass tube, it was found

to be impossible to bright anneal the work at a temperature of 1,250° F., which is the upper range of brass annealing temperatures. However, if the tube were made of iron, the operation was very successful at 1,250° F. It was natural to suppose under these conditions that the bright annealing reaction was due to the presence of hydrogen that had been set free as the result of the hydrocarbon breakdown.

The following analysis of these hydrocarbon gases is of interest. Passing 175 cc. of propane per minute at a temperature of 1,300° F. with no catalyst present, it was noted that an oil formed in the outlet of the tube, the gases containing 9% hydrogen. When iron was present at the same temperature and with the same gas flow, there was a heavy carbon deposition and the outlet gases contained 49% hydrogen.

The temperature of 1,250° F., which seems to be the minimum annealing temperature for hydrocarbon gases, is too high for the commercial annealing of certain grades of brass. It was found, during this investigation, that it was not necessary to heat the metal to a temperature of 1,250° F. in order to obtain bright annealing. If the furnace muffle, containing the hydrocarbon gas, were heated to a temperature of 1,250° F., a strip of brass could be passed through this without attaining the muffle temperature and still be bright. This fact was determined by measuring the grain size of the brass so treated since this varies in accordance with the temperature. Here was a rather strange thing for if the metal were heated even in an atmosphere of pure hydrogen, there would be a certain degree of tarnishing of the metal at a temperature about 800° F., which is the point where gas evolution from the metal becomes noticeable. This tarnishing would persist and increase until a temperature of about 1,250° were reached. However, if the furnace temperature were maintained at 1,250° or above, the metal could be passed through in such a way as never to attain a temperature higher than 800° without any indication of tarnishing. The indication seems to be that when hydrogen is heated to a temperature above 1,250°, it becomes particularly activated so that it will reduce very quickly the oxide formed on many metals at lower temperatures.

As has been indicated, it is possible to remove by means of a hydrogen atmosphere the easily formed oxide when the hydrogen is in this activated form. There is one serious objection, however, to the use of hydrogen alone as an atmosphere for annealing. This is the effect that hydrogen has upon volatilization of zinc. In the usual annealing operation it is found that the presence of zinc vapor becomes noticeable at temperatures around 1,000° F. In the case of hydrogen, however, there is considerable volatilization at 800° F. When conducting this annealing operation in a glass tube, there was formed on the cooler portions of the tube a very heavy mirror of zinc. The removal of this zinc from the metal surface in a high hydrogen atmosphere is very objectionable and must be avoided in commercial work. For this reason, the use of a hydrocarbon gas is preferable since it does not produce so much free hydrogen.

The question naturally arises as to whether the carbon in the broken down hydrocarbon gases has any effect on the bright annealing reaction. To determine this, we used ammonia (NH_3) that had been broken down into nitrogen and hydrogen, thus eliminating the presence of free carbon in the surrounding atmospheres. We found the same bright annealing reactions occurring in the same way and at the same temperature. That is to say, a minimum of 1,250° F. gave the bright annealing reaction on brass.

The hydrocarbon gases that have been used for this purpose and which respond in a similar manner have been methane, ethane, butane, propane, acetylene and ethylene. These are the gases that we have had conveniently at hand.

The general problem of bright annealing has been approached also in our laboratory in a different way. We had in mind to use an atmosphere of flue gas such as might be obtained by controlled combustion in a gas-fired furnace. A flue gas of the so-called reducing character was used which contained about 2.5% CO carbon monoxide, no oxygen O_2 and 8.5% carbon dioxide CO_2 in addition to water vapor and some sulphur compounds. Such an atmosphere is suitable for annealing certain metals, for instance, copper and certain nickel alloys, but it is not at all suitable for annealing brass or zinc bearing alloys. The presence of a very slight trace of water vapor is highly oxidizing to brass when heated in its presence and the same is true of carbon dioxide gas in very small amounts as referred to above. It was impossible to get results by purifying this flue gas by removing the carbon dioxide and moisture for our tests had shown that even with an atmosphere as inert as nitrogen, the brass would tarnish when heated. Therefore, if we were going to use flue gas at all for this purpose, it would be necessary to find some means for overcoming these objections.

By adding the vapors of methanol, CH_3OH, to such a flue gas, we obtained very interesting results in the bright annealing of brass. By this means, we were able to bright anneal any of the zinc bearing alloys at any annealing temperature desired without any difficulty from any of the constituents of the flue gas except the moisture content which had to be removed before saturating these gases with methanol. The presence of carbon dioxide in these gases was not at all objectionable. The mechanism of the reactions involved is rather complex.

When the vapors of methanol are passed through a silica tube at a temperature of about 1,200°, there is only a slight breakdown of the methanol into hydrogen and formaldehyde. In the presence of a catalyst, however, this reaction goes on at much lower temperatures and much more readily. According to Frölich (Journal of the Society of Chemical Industry, June 29, 1928), the catalytic decomposition of methyl alcohol is more complicated than one might have expected. The reactions involved are tentatively represented by the following key:

$$CH_3OH = HCHO + H_2$$

The HCHO breaks down subsequently into ½ molecule HCO_2CH_3 and then finally into $CO + H_2$.

In the bright annealing of brass, the metal itself serves as the catalyst or perhaps it is the oxide of zinc that is formed by the liberation of occluded gases from the metal. Under these conditions, the oxide formed is immediately reduced and reduced almost before it is formed because there is no indication in the process of any tarnishing of the metal. The reaction that takes place at this point is the bright annealing reaction. If the operation is conducted in such a way that the methanol does not come into contact with the metal surface being annealed until after it has been broken down into H_2 and CO, then the bright annealing reaction will not go on. If it is conducted so as to make the metal being annealed the catalyst, then the bright annealing reaction will go on even at low temperatures. In other words, a piece of brass that has been polished may be heated to any temperature up to the maximum annealing point in an atmosphere of flue gas saturated with methanol vapors without showing any indication of tarnish at any time.

The effect that different gases have on the catalytic breakdown of methanol has been studied in these laboratories. This has been studied by detecting the temperature at which formaldehyde is formed when passing

different gases saturated with methanol through heated tubes containing brass. Formaldehyde may be detected by passing the outlet gases through a tube containing rosaniline solution decolorized by sulphurous acid. The appearance of a pink color in the solution indicates the presence of formaldehyde. In this way, when using an atmosphere of nitrogen as a carrier for methanol, formaldehyde is first detected at a temperature of about 1,000° F. Using carbon dioxide as the carrier, formaldehyde is detected first at a temperature of about 1,250° F. In the presence of flue gas, however, formaldehyde may be detected at a temperature between 300° F. and 400° F. This seems rather strange because flue gas consists essentially of carbon dioxide and nitrogen. A synthetic flue gas made up of a mixture of nitrogen and carbon dioxide and used as a carrier for methanol gave the formaldehyde reaction at about 1,050° F. We cannot explain why this anomaly exists. We only suggest that it may be due to the presence of SO_2 of other sulphur bearing compounds contained in the flue gas as it comes from the furnace.

It has been shown by many investigators that the presence of a very small percentage of carbon dioxide in the atmosphere will tarnish brass very readily. This matter has been referred to several times before in this paper. For some reason, this reaction does not take place in the presence of methanol vapor. To determine whether or not a high concentration of carbon dioxide would inhibit the methanol reaction, we used an atmosphere of carbon dioxide as the carrier gas for methanol. By this means we found that the brass sample would tarnish badly at a temperature of about 800° which seems to be coincident with the liberation of occluded gases from the metal and that this tarnishing increased progressively until a temperature of about 1,250° was reached. At this point, the bright annealing reaction took place normally. This indicated to us that the bright annealing reaction was coincident with the formation of formaldehyde from the alcohol. For instance, when we used an atmosphere of nitrogen as the carrier for methanol, the metal would tarnish at 800° as usual but this tarnish would be quickly removed by the bright annealing reaction at about 1,000° F. which again corresponds with the temperature of formaldehyde formation. When using flue gas, however, there was no indication of tarnish at any temperature during the annealing operation.

Since there is no minimum annealing temperature especially adapted for the methanol reaction, it has been found possible to meet the commercial requirements of a low temperature anneal by this means. Articles made from brass or nickel-silver may be bright annealed at any desired temperature without any danger from tarnishing. They may be held at any temperature desired without danger of spoiling the surface in any way.

On the basis of this work, it has been possible to develop two different methods for bright annealing metals. These have a wide range of applicability as to metal annealed and temperatures used. The first one described, that is, based on the breakdown of a hydrocarbon gas, seems to be particularly well adapted for the annealing of metals in strand form either as strip or as wire. The other method, using flue gas and methanol, is especially well adapted to the annealing of stampings or other bulky materials that may require a lower temperature anneal.

Bronze Pressure Castings

By J. E. CROWN

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The Manufacturer of Bronze Castings for Pressure Service Demands a High-Grade Product. The Factors Listed of Most Importance Are: Selection of Alloys, Design of Pattern, Allowance for Machine Finish, Method of Molding, Character of Cores, and Types of Heads and Gates.

A PAPER READ AT THE MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION IN CHICAGO, MAY 4 TO 7, 1931.

THE manufacture of bronze castings for pressure service demands a higher grade of product than is required of castings where pressure testing is not a part of the specifications. A casting apparently solid, free from surface defects, true to dimensions and fully acceptable as an ordinary casting, may fail miserably when subjected to the required pressure test.

Successful production of this class of work is possible only with a full appreciation of the various factors involved. So often the question is seen in technical papers, "What alloy should be used for pressure castings?" apparently asked with the belief that selection of the alloy would solve the problem. However, selection of the alloy is only one factor; equally important factors are: Design of the casting, design of pattern, allowance for machine finish, method of molding, character of cores, type of heads and gates.

Alloys

The choice of numerous alloys may be made, final selection being determined usually by other desirable properties or as a result of a manufacturer's previous success with a given composition. Following are a few of the red-bronze alloys that have been successfully used for pressure work:

Cu	Sn	Zn	Ni	Pb
88	10	2		
88	8	4		
87	9	3	1	
85	5	5	0	5

Regardless of the alloy selection, it is essential that extreme care be exercised in melting to prevent overheating,

oxidation or gas absorption in order to obtain consistent result, uniform quality and the maximum physical properties.

Various types of furnaces are used for melting, including the pit-type crucible furnace using oil, gas, coal or coke as fuel, the reverberatory furnace or electric arc and induction-type furnace, all of which have their peculiar advantages.

The principal alloy used at the U. S. Naval Gun Factory for nonferrous pressure castings consists of 87.25 per cent copper, 0.75 nickel, 9 tin and 3 zinc, made by the natural-draft pit-type crucible furnace using coal for fuel

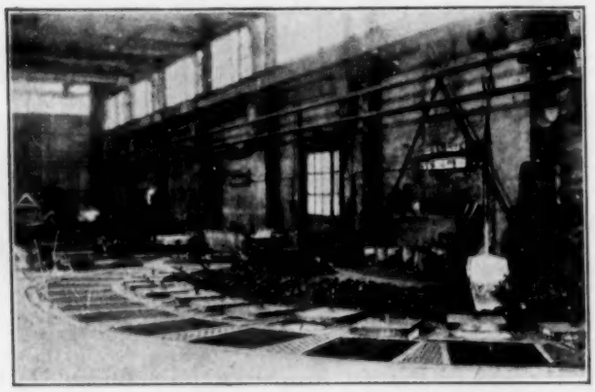

Fig. 1—Battery of Natural-Draft Pit-Type Crucible Furnaces, Coal Is Used for the Bed and Coke for Side Walls

in the bed and coke for side walls. Fig. 1 shows a battery of this type of furnaces.

Method of Melting Described

Following is the process regularly used: The required amount of copper is melted down, protected from oxidation by placing crushed charcoal in the crucible to form a covering for the metal. If the copper, after being melted, shows any indication of wildness, a small quantity of carbon-free manganese is added (rarely exceeding 1 oz. per 100 lbs.), and to this bath is added the nickel, preferably in the form of copper-nickel hardener; then the tin is added and, finally, the zinc.

The entire charge is then permitted to remain in the furnace for sufficient time to permit complete solution of all ingredients. The metal is then pigged in iron molds, analyzed and later remelted for casting use, care being taken on remelting to prevent oxidation or overheating.

Proper pouring temperature is of vital importance and varies with design of the casting. However, it may be generally stated that pouring temperature should be as low as is practical to obtain a well-run casting. The average pouring temperature at the Naval Gun Factory is 1950 degs. Fahr.

Design

Too frequently the influence of design on the problems encountered in the manufacture of pressure castings is not appreciated. Conditions exacting the use of all the resources of the foundryman often could be improved or eliminated by some slight change in design.

Wherever practical, design should permit uniform cross-section of metal, or the avoidance of sudden changes from one cross-section to another, keeping in mind that uniformity is desired at the time of pouring and that an allowance for machine finish may cause non-uniformity even though the finished product may be uniform.

The liberal use of fillets, avoidance of right-angle bends, maintaining of surface skin and the coring of heavy bosses are details of design which aid materially in the production of pressure castings. Fig. 2, *A* and *B*, show two methods of providing large boss on the side of a cylinder for attaching valve fitting. Fig. 2-*A*, showing a solid boss attached to a light wall, is poor design due to serious change in cross-section. Fig. 2-*B* shows the method of providing the same boss yet maintaining uniformity of cross-section.

A study of the foundry problems involved in the manufacture of pressure castings, especially those of intricate design, should begin on the drawing board.

Pattern Equipment

Accurate and well-designed pattern equipment is of major importance for this type of work to maintain the features studied in design, as incorrect shrinkage allowance, excessive machine finish or inaccurately fitting cores may defeat the very object sought in the original design.

Too much stress cannot be placed upon the importance of proper machine finish allowance. As is well known, the grain size of bronze is in direct ratio to the rate of cooling—the more rapid the cooling, the closer the grain. Therefore, the metal that comes in direct contact with the mold being rapidly cooled has the best grain structure of the casting, and an excessive amount of machine finish, possibly allowed to take care of inaccurately molded castings, causes this close-grained metal to be removed by machining, thus exposing the more open-grained interior sections of the castings to withstand the required pressure.

Where practical, and whenever possible, match plates,

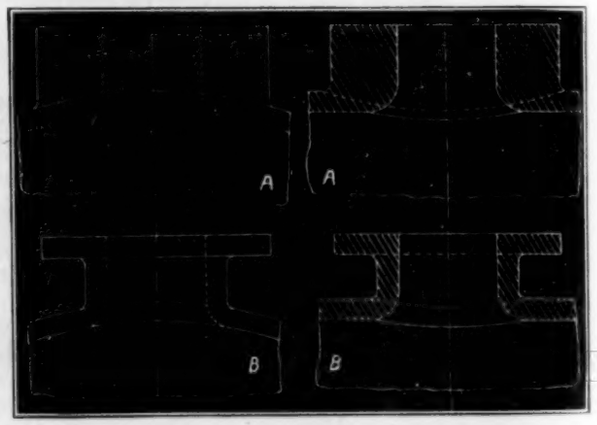

Fig. 2—A, A Show Poor Design of Boss Due to Serious Change in Cross-Section. B, B Show Good Design of Same Boss, Giving Uniformity in Cross-Section

set gates and similar devices should be used not only to reduce the cost of manufacture but to minimize the effects of the personal equation.

Molding

If the exercise of care, accuracy and intelligent planning is important in melting, designing and pattern construction, it is doubly so in molding to obtain success and counteract the normal variables found in foundry practice.

As design has attempted to maintain cast finish when possible, and as pattern construction has provided the minimum allowance for machine finish when machining is

necessary, it is obvious that greater care must be exercised in the making of the mold and core to insure the final product being in accordance with desired dimensions.

Pressure castings may be cast readily in green sand except for the larger class of castings, when dry sand provides a greater factor of safety. Sand control insures more uniform results.

Type and Size of Gates Are Important

Selection of the type and size of gates should be given serious consideration in order to permit the entrance of metal to mold with the least amount of agitation and to distribute metal as far as possible to permit uniform rate of cooling in various sections. Chilling of heavy bosses may be necessary so as to aid in securing a uniform rate of cooling.

In some instances it is advisable to eliminate a shrink head which would normally be used on a non-pressure casting and to resort to chills. The shrink head not only keeps that section of the casting liquid for a longer period, thus increasing its grain size, but its subsequent removal also destroys the skin effect.

Cores

The importance of the effect of the character of cores should not be overlooked, as they play an important part in the manufacture of pressure castings.

Cores should be made from sands having a high permeability. The binder material should be such as will give a strong body to the core yet having the feature of disintegrating at casting temperature, in order to permit complete collapse of the core and prevent any restriction to the normal contraction of the casting.

Cores must be well baked and thoroughly vented to permit rapid exodus of the gases, as the slight quivering of metal around the core, although it may not prove detrimental for certain castings, will prove fatal to pressure work.

Typical Hydraulic Cylinder Casting

Fig. 3 shows a casting of a hydraulic cylinder 21 inches in diameter, 10 feet long, an average wall thickness of ⅜ inch, weighing 2,000 lbs. This was cast in dry sand of red bronze (87.25 copper, 9 tin, 3 zinc, 0.75 nickel composition), and tested to 300 lbs. per sq. in. pressure test after machining.

This casting was molded in a horizontal position with a split pattern, but was poured in a vertical position.

A 3-inch diameter down gate was provided for entrance of the metal, which connected with a circular runner around the core print to which were attached 24 down sprues having a total volume of one and one-half times the volume of the runner to prevent nozzle effect upon the metal. The entrance gate was extended 12 inches below the runner so as to break the fall of the metal and to permit easy flow of the stream to the casting.

A brick-lined reservoir of sufficient size to hold the full amount of metal was connected to the 3-inch sprue, the reservoir being equipped with a graphite stopper to permit holding of the metal until it was quiet and of the proper temperature for pouring. A shrink head was provided by extending the pattern 8 inches.

The design of the assembled unit, of which this casting was to be a part, would not permit the use of a uniform section boss as shown in Fig. 2-*A*, but a compromise between the design of Fig. 2-*A* and Fig. 2-*B* was obtained for the rectangular pads, permitting the coring out of all excess metal and retaining only a sufficient surface as was required for attaching the valve. However, even this difference in thickness was considered too great to permit proper cooling, and these pads were chilled.

Fig. 3—Casting of 21-Inch Diameter Hydraulic Cylinder 10 Feet Long. Gating Arrangement Shows 3-Inch Diameter Down Gate Connected to Circular Runner Around Core Print

Original design of this casting required machining of the entire interior, but a later design provided four narrow bearing strips running the entire length of the cylinder with cast finish between the strips, and danger of leakage was reduced.

A loam core was used for this casting so as to permit maximum unrestricted contraction and to obtain more easily the desired accuracy of interior.

The general principles discussed in this paper have been applied in the manufacture of numerous pressure castings of intricate design at the U. S. Naval Gun Factory, resulting in lowering the percentage of rejections for castings required for pressure service.

Uses of Silver

A recent inquiry to the United States Department of Commerce regarding the uses of silver elicits the following information from C. E. Julihn, chief engineer, Common Metals Division:

The principal use for silver is in the various monetary systems of the world.

The next important use is in the manufacture of sterling and plated ware (in the United States and England).

The domestic photographic film industry has, in recent years, used from 8,000,000 to 10,000,000 ounces of silver annually.

According to the Annual Report of the Director of the Mint for the fiscal year ended June 30, 1930, the quantity of silver issued during the calendar year 1929 for use in manufactures and the arts amounted to 42,359,082 fine ounces. Old jewelry, plate, scrap, etc., contained in private refineries' and dealers' returns, and that returned to monetary use contributed 11,381,523 ounces to the above.

There is a tabulation of the estimated distribution of world production in very general figures and not by all uses in "The Price of Silver," a trade information circular of the Bureau of Foreign and Domestic Commerce, reprinted in the Congressional Record.

Among other uses of silver are silver-solder, jewelry, silvering of glass mirrors, dental supplies, chemical and electrical apparatus and medicine.

A report giving the results of a canvass just made of concerns using silver during 1928-29 is in progress of publication by the Bureau of Mines.

The Cleaning of Metals Before and After Plating

By OTTO H. LOVEN

Consulting Electro-Chemist, Bridgeport, Conn.

The Treatment of Work for Proper Electrodeposition. This Article Covers Preliminary Handling, Cleaners, Rinsing, the Use of Water and the Care of the Solutions.—Conclusion*

Cau ions

IT IS not always possible to time cleaning operations so as to have a tank or barrel ready to receive the work the moment the last rinsing is completed, which, of course, is the ideal condition. In several instances the operator has been observed to take the work out of the rinse, and hang it up, or lay it on a bench. What now takes place can well be imagined. Atmospheric conditions in the most modern, up-to-date plants, not to mention those of the average run, are not conducive to maintaining chemically clean and untarnished surfaces for any length of time, what with steam, acid fumes and other contamination in the air of the room. Work left exposed to such atmospheric conditions, even when dry, tarnishes very quickly, and the more so when the work is still wet. Conscientious platers, who have observed the ill effects on work exposed to the air after cleaning, have tried various means of overcoming this difficulty, the main object being to exclude the fume-laden air. The most successful, and yet the simplest method, is to leave the work in the last rinse water until ready to hang in the plating solution. This method, provided absolute cleanliness is observed, is unfailing. Do not, however, go to the extreme, and imagine that the work can be left in the water forever. Brass and other non-ferrous metals may be left somewhat longer, but steel and iron must be taken out and plated after 5 minutes, to avoid oxidation. This rinse water must be tested several times daily for a week or more, to determine if any acid or alkali contamination is evident. The slightest trace of either is fatal. In such a case it will be necessary to add yet another rinse, or, it may perhaps be overcome by increasing the rate of flow in the two last rinses. This must be checked by chemical test.

Provided all the above steps have been followed conscientiously, the work is now chemically clean and will take an adherent coating, so far as it is dependent on the cleaning operations.

It is not the intention to discuss plating solutions and the methods used in plating in this paper, but only to consider the steps necessary to create a chemically clean surface prior to plating, and the rinsing and drying operations after plating, which will deliver the product in the best possible shape for further finish or assembly. We will therefore assume that the plating operations have been performed, and the work is being brought out from the plating tank.

*Part 1 of this article was published in our July issue.

Rinsing Plated Work

We are now ready to rinse the plated work. Here, again, we meet with various methods. The most primitive, and still very common method is the old, sawed-off barrel, filled with cold water, into which work of every description, and from any kind of solution is rinsed off. In the past, when the art of plating had not progressed as far as it has today, this was excusable, but now such a condition is unforgivable.

Not only the appearance, but also the protection of the plate against corrosion is materially weakened, and the foundation for a much earlier failure is laid at this time. Especially where oxidized work is also handled, does this cause trouble, as spotting out is very often caused by immersion in this, so-called, rinse. The next better method of rinsing, although not thorough enough to be recommended, is to have two cold rinses. While much better than the first mentioned, there exists still an insufficiency of proper media for completely removing all traces of the plating solution. In the modern plants, where quality is religiously maintained, there are two "first rinse" tanks maintained, one for acid solutions, and one for alkaline and cyanide solutions. Both of these are heated to a temperature of from 125° F. to 180° F., depending on what plate is being rinsed. The heat should be applied through coils, and the steam should not be let into the water directly, unless it has first been filtered to remove all traces of iron oxide, oil, and condensate. These waters must, of course, be kept running, to minimize the chance of building up in acid or alkali respectively, and thereby contaminating the next rinse. The time in the hot water is from 3 to 5 minutes. The next rinse is preferably a cold shower rinse, although a tank rinse may be used, if working solid parts, where there is small chance of any solution being retained in the corners and crevices. When working hollow ware, the shower is the only thing that will insure complete removal of the solution. As a rule these two rinses are sufficient, but some plants employ still another rinse before the hot water dip, and drying operation, as an additional safeguard.

Treatment for Coloring

If the work is destined to receive a coloring or burnishing operation after plating, it is, of course, not necessary to carry through all the above rinses, if another washing is given after the operation is completed. It is then sufficient to rinse the work in two hot waters, and let dry.

After coloring, a wash in a mild soap solution—at 180° F.—will, in most cases, clean off all traces of the coloring compound in a couple of minutes. But here, again, the fact must be emphasized, that it is very poor economy to use compounds, in which a mineral grease is used, for same reason as before explained. Two hot waters, both running, are sufficient to remove the soap, and the work may then be left to dry, or dried out in a sawdust box. If a good grade of hardwood sawdust is employed, changed often, and kept clean, this method has some advantages; but if not, it causes trouble, and the air drying method is better. Should, as in the case of most automobile parts and lately jewelry and household goods, a second plate, say chromium, be applied, the work is then in fine shape to be hung in the tank after the last hot rinse, as it is already warmed to a temperature, which will permit it to go in without chilling the solution. In the event of such a procedure being used, the work should be racked for chromium before being cleaned, and the drying operation should be omitted. As before mentioned in connection with the cleaning before the plating, the work may, if necessary, be left for a few minutes in the last hot water tank to keep it out of the air, if the tank is not ready to receive the work instantly. Many research workers on chromium plating recommend a dip in the chrome drag-out tank before going into the plating solution, but no mention has ever been made of heating the same. If the drag-out tank is cold, the benefit derived from bringing the pieces hot from the rinse water is lost; heating of the drag-out tank to a temperature near that of the chromium solution has been beneficial in this respect, without showing any ill effects from oxidization.

Of several hundred tons of work, inspected by the author in various plants, during the past year, where complaints have been had on the quality of the product, a noted improvement has been made in almost every instance, after the water, or rather, the application of the water has been changed.

The expression "Familiarity breeds contempt," applies aptly to conditions in the plating rooms. Frequently an installation, designed to perform a given job, is, from time to time, enlarged to do other work, not provided for in the original layout. It is very seldom found that the cleaning and washing units are enlarged in proportion, to take care of the increase. Where several gradual increases of this nature have taken place during a period of a number of years, each addition not being sufficient in itself to cause overloading, it has been proven, time and time again, that no thought has been given to the cleaning and rinse unit, and the result has invariably been that overloading occurred, and the product suffered. Where such a condition is evident, a check-up by a reputable engineer, who can, and will advise what steps are to be taken to overcome the condition, without wasting a large sum of money unnecessarily, will pay for itself in a short time by a reduction in spoiled and rejected work.

Importance of Water

Cleaning of metals for electroplating depends in the main on water, water, and still more water. It is therefore of great importance that this detail be treated intelligently. But mark, this is not to be understood that a perfect cascade of water, applied in any old way, will accomplish the impossible, or, that a given body of water may be used only once, and then discarded. On the contrary, the same water may, in many instances, but not always, be used several times over.

An actual illustration of what may be accomplished in this line, is an installation of a large manufacturer, making a multitude of small parts and plating the same at a rate of 25 to 30 tons per day. The washing and rinsing operations were as follows: Potash (boiling); Hot water; Cold water; 10 per cent Muriatic acid; Cold water; Cold water; 4 oz./gal. Cyanide; Cold water; Cold water. The total amount of water available, for this unit, was a 1½ in. pipe at 55 lbs. pressure. It is evident that if this volume (as was actually done) is diverted through branch pipes to each individual tank, there will be a very slow change of water in each tank. The unit had actually run in this manner for some time, but the output was not satisfactory. The plating solutions had been checked, and no relief was had. Outside advice was then sought, to determine the source of trouble. One of the first steps, then, was to test the waters and the cleaner. The concentration of acid and alkali, which was built up during the day's run was determined hourly, and the results tabulated. (See Chart 1, curves 1-6). By providing a number of shut-offs, and by-passes in the

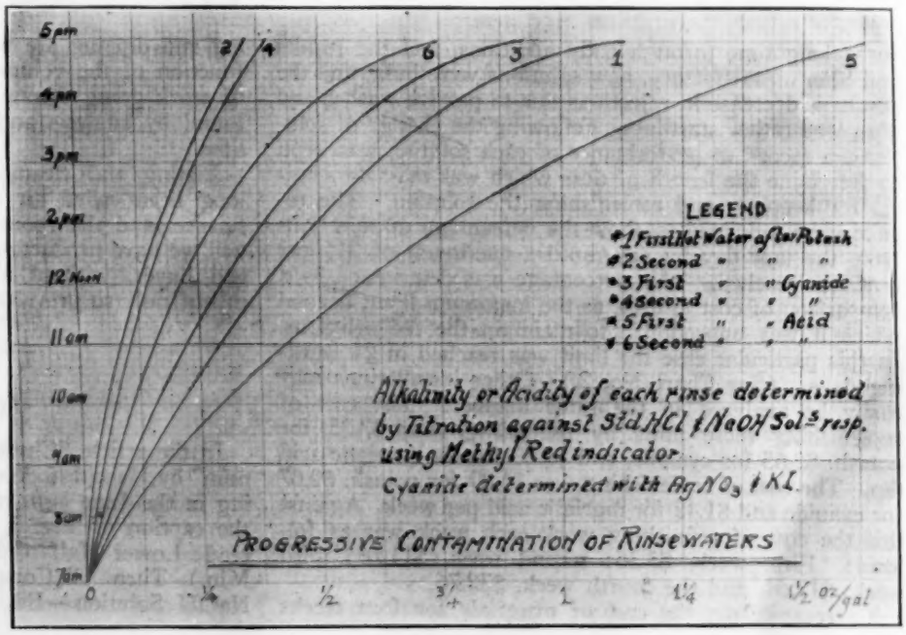

Chart 1—
Progressive
Contamination
of Rinse Waters

line, and by flowing the waters in reverse sequence, from one tank to another, several experiments were run, to determine if the rate of flow could be increased in this manner without deriving any ill effects from the mixing of the different waters. In fine, the entire unit of tanks was back-connected so that the water from the last rinse tank, instead of going to the sewer, as before, was connected to the next last, and so on, through the whole unit. In this manner the entire volume of the 1½ in. pipe was fed to the last tank, giving a veritable flood washing, and the trouble was entirely overcome. While there was some mixing evident in some of the rinses, this proved beneficial, as the various chemicals neutralized each other in turn, and due to the swift flow of the water, provided a rinse of much lower acid or alkali concentration (most of the time indeterminable) was given to the work.

Periodic Cleaning Out

Potash tanks, acid and alkali dips should be cleaned out frequently, the time being dependent upon size of tank, and the volume of work going through. The old solution should be entirely discarded, and a brand new solution mixed. This is preferable to trying to build up the old one, as contamination from outside sources introduce elements, which tend to neutralize some of the fresh chemicals added.

In one factory, where the solutions had been maintained for a long time through daily additions, and the results had been unsatisfactory, new solutions were built, and the resultant decrease in rejections due to passive washes and dips, was rather startling. Following the change of solutions, a record of performance of each solution was kept, to determine the length of time which was most economical for keeping, and replenishing the solution. The results were tabulated to show the percentage of rejections from the unit day by day, until a maximum of 2½ per cent was reached. This percentage was determined by a comparison of cost figures, as the maximum limit, beyond which it was unprofitable to maintain the old solutions. In this particular case the limit was reached in 24 working days. (See Chart No. 2.) Other installations may easily be analyzed in the same manner. The cost of replenishing these units by rebuilding, was $7.35 for potash, $2.65 for cyanide, and $6.60 for the muriatic acid dip. The cost of replenishing was $1.89 for potash, $0.67 for cyanide and $1.42 for muriatic acid per week. Against this the cost of refinishing work each week was as follows: First week, $3.36; second week, $11.76; third week, $17.64, and the fourth week, $32.76.

To recapitulate, the cost of materials for four weeks was $28.54 and the cost of refinishing was $65.52. If the solutions had been rebuilt every two weeks, the cost of materials would have been $41.16 and refinishing, $30.24 for the same period of four weeks. By rebuilding the solutions in this unit once every two weeks, the manufacturer saved $22.46 for each period, not counting the loss of time, used before for refinishing rejected work.

Another observation in a similar case led to the discovery of the fact that accumulated fats, which settle off on the potash during the night when the solution has cooled, must be religiously removed before the new day's work starts. Many plants have the heat controlled from the boiler room, and nobody comes near the potash solution before it is heated in the morning. Consequently this is not noted, and when the solution is tested by a hydrometer, which is the most common method, very few people having realized the importance of chemical analysis of the potash solution, the solution may show full strength and still be very weak, due to the presence of partly saponified soap fats in the solution. If this layer is removed, when the solution is cold, the efficiency of the solution will be enhanced, and the hydrometer reading will show more nearly the correct strength of the solution. In every factory there is nearly always a man who is employed on odd jobs and generally starts work an hour or more ahead of the others. Such a man, with a little instruction, will soon learn to take care of this detail.

The limit of time in which the solutions used for washing and dipping are working to the best advantage, is a function of the volume of the solution, and the amount of work going through in a given time. This must be found by analysis and recording over a long period of time.

Plating and cleaning before and after plating have long been called an art. This is erroneous. It is a science, and the sooner this fact is realized, the sooner will we have production, satisfactory to the manufacturer, and buyer, without all the heartaches and disappointments, now so prevalent in the industry.

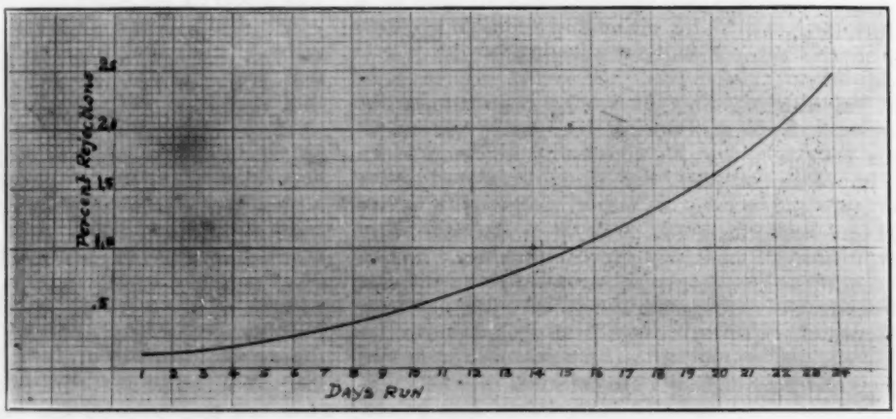

Chart 2—Increased Contamination of Tank from Day to Day

Correction

In the article "Chromium Deposits Directly on Aluminum" by Harold K. Work and Charles J. Slunder, appearing in the June issue, there was a typographical error in the caption of Fig. 3, on page 244, which should have read: Lower Half of Each Piece Chromium Plated (15 Min.), Then All Completely Immersed in 2.5 Per Cent NaOH Solution.—Ed.

The Coloring of Tin, Tin-Lead and Aluminum Foils

By W. W. ROGERS

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A Detailed Description of the Methods, Chemical Solutions and Mechanical Equipment Used in Production.

THE solutions used in the coloring of foils are basic colors dissolved in denatured alcohol with orange shellac used as the base. The following is a list of the dyes most suitable for the purpose.

Rhodamine B Ex. Conc.
Victoria Blue B Ex.
Methyl Violet 3B or 6B.
Malachite Green Crystals
Auramine O Conc.
Aurine
Thioflavine T.
Chrysoidine Y.

Many other dyes may be used, but a combination of these colors will give almost any desired tint. These dry colors are dissolved in denatured alcohol and filtered. The solutions must be free from sediment and clear.

Solutions of the dry colors are made up as follows:

Dissolve 6 ozs. of Victoria Blue in 3 quarts of alcohol and filter.

Dissolve 6 ozs. of Malachite Green in 3 quarts of alcohol and filter.

Dissolve 18 ozs. of Rhodamine in 3 quarts of alcohol and filter.

Dissolve 3 ozs. of Chrysoidine in 3 quarts of alcohol and filter.

Dissolve 6 ozs. of Auramine in 3 quarts of alcohol and filter.

Dissolve 8 ozs. of Aurine in 3 quarts of alcohol and filter.

When the alcohol is added shake up vigorously from time to time, or the colors will not dissolve freely, and will form a hard mass on the bottom of the bottle that is very difficult to remove. Allow twenty-four hours before filtering.

The Base is made as below:

Orange Shellac	25 lbs.
Alcohol	10 gallons
Castor Oil	1 pint
Venice Turpentine	1 quart
Sil-O-Cel	¾ lb.

These ingredients should be placed in a mixer and well stirred frequently. It should not be drawn off for at least 36 hours. Filter through fine canvas, duck or other suitable medium. The solution must be clear. The Sil-O-Cel is infusorial earth added to assist the clearing of the solution. This mixture is quite difficult to filter without a filter press, which is a necessity if very large quantities of foil have to be colored.

When medium quantities have to be colored, up to about 500 lbs. per day the following method is advisable, as no filtration is necessary.

Brown French Varnish	20 gals.
Alcohol	12 gals.
Venice Turpentine	6½ pints
Castor Oil	3¼ pints

As there are no losses in making up this mixture, it is practically as economical as the first method for moderate production, and as it is a perfectly clear solution it gives very brilliant results.

The Elastic Mixture

Venice Turpentine	3 pints
Castor oil	1 pint
Alcohol	4 pints

This mixture must be well shaken until the ingredients are thoroughly incorporated.

The mixing of the solutions before going to the machine takes two phases; first the preparation of the stock color solutions, that keep indefinitely, and the finished lacquer ready for the machine which must be used when made. The stock color solutions can be blended to give an infinite number of shades.

PREPARATION OF THE STOCK COLORS AND LACQUERS FOR THE MACHINE

Violet

Stock Color

Victoria Blue solution	6 ozs.
Rhodamine	1 pint
Alcohol	1½ pints
Sulphuric Acid	8 cubic centimeters

Lacquer for Machine

Stock Color	1¼ pints
Alcohol	3 pints
Base	1¼ pints
Elastic mixture	3 ozs.

Blue

Stock Color

Victoria Blue Solution	4 pints
Sulphuric Acid	10 cubic centimeters

Lacquer for Machine

Stock Color	1¼ pints
Alcohol	2 pints
Base	1¼ pints
Elastic Mixture	2 ozs.

Green

Stock Color

Malachite Green Solution	1 quart
Auramine Solution	3 pints
Sulphuric Acid	12 cubic centimeters

Lacquer to Machine

Stock Color	1¼ pints
Alcohol	2 pints
Base	1¼ pints
Elastic Mixture	2 to 3 ozs.

Red

Stock Color

Rhodamine Solution	12 ozs.
Chrysoidine Solution	3 pints
Sulphuric Acid	10 cubic centimeters

Lacquer to Machine

Stock Color	1¼ pints
Alcohol	1¾ pints
Base	1 pint 14 ozs.
Elastic Mixture	3 ozs.

Gold

Stock Color

Aurine Solution	2 pints
Chrysoidine Solution	2 pints
Sulphuric Acid	8 cubic centimeters

Lacquer to Machine

Stock Color	1 pint
Alcohol	4 pints
Base	1¾ pints
Elastic Mixture	2 ozs.
Sulphuric Acid	3 cubic centimeters

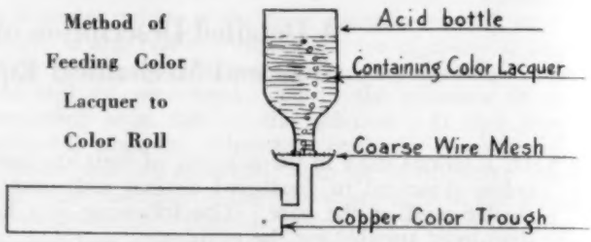
In making up the final lacquers, pour the alcohol into the bottle first, then the stock color solution. If this action is reversed a very marked turbidity is frequently produced, which will not go into solution, and will cause a lack of brilliancy in the finished product. The other ingredients may then be added in the order given.

By varying the amounts of color and alcohol an endless number of shades can be obtained, but the quantity of the base present must not fall much below the percentage given in the formulæ, or an uneven, steady or lustreless film of color will result.

The colors described are more in demand than any others. Many others can be produced by other dyes, and by combinations of the dyes listed—their beauty and lustre depending upon the artistic taste and skill of the operator.

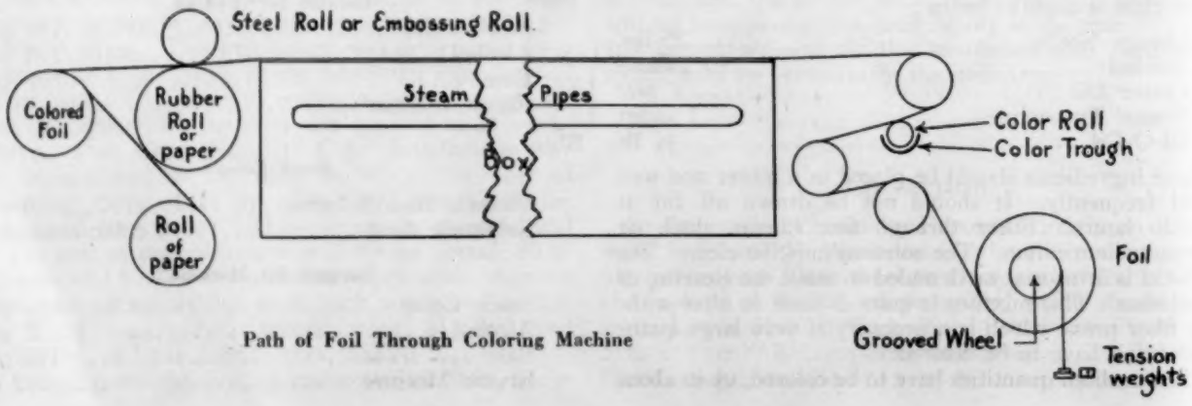
The metal as it comes from the finishing rolls is not flat and even enough for coloring, so it has to go through the flattening rolls. In these rolls only one of them is geared, and the other works by friction. After this process the spool of metal is ready for the coloring machine. If this flattening process is neglected an inferior product is bound to be the result, as an uneven and spotty colored film will be produced.

There are various types of coloring machines, but the principle of all of them is identical. The sketch showing the path of the foil through the machine will illustrate the idea very clearly. The color-lacquer is fed into a U-shaped trough as shown. The color is held in the bottle by atmospheric pressure and as it is used up more flows from the bottle to take its place, so that the solution is maintained at the same level in the trough. The coloring



roll is about one inch in diameter and is generally made of copper, finely polished. It is geared to move at approximately the same speed as the foil passing over it. A two or three-step pulley should be placed on the coloring roll and its drive. The foil should be kept exactly parallel with the coloring roll at the required pressure, which is adjustable by springs in the bearings of the roll over the coloring roll. After receiving the color the foil passes over a slightly arched metal plate attached to a box about 25 feet long in which is placed manifold steam pipes by means of which the plate is heated to about 160°F. to 180°F. The alcohol rapidly evaporates from the film in passing over the hot plate, and the foil passes through rolls, the top one of steel and the bottom of sufficiently hard rubber and finally to a spool on which the now finished plain colored product is wound. Tissue paper is generally interposed between the layers of foil to avoid possible sticking, and to enable the individual sheets to be easily separated when the colored foil from spool or winder is cut to the required size. The paper is wound on the spool during the process of coloring as shown in the sketch. If the foil is to be embossed, an embossing roll is substituted for the plain steel roll, and a hard paper roll in the place of the rubber roll in the stand of the finishing rolls.

During the operation care must be taken to keep the foil at a proper tension while it is passing over the hot plate. A quite satisfactory way of accomplishing this is by passing a cord over a grooved wheel attached to the



Path of Foil Through Coloring Machine

spool of foil that is to be colored, to which is suspended the necessary weights to give the required tension. This is illustrated in the sketch. Foil to be colored is usually from 4,000 to 7,200 square inches per pound. If much lighter than 7,200 square inches it is likely to break in passing over the hot plate. No attempt should be made to color perforated foil.

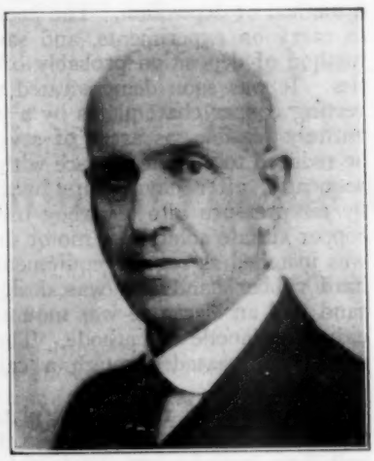
All foils should be inspected before coloring, and coils should be selected as free from pin-holes as possible. The more polished the surface of the foil the more brilliant will be the film of color. During the process the foil must be tested to insure that the color does not rub off. If it does, increase the amount of the elastic mixture until it is fast.

Every care must be taken to keep all utensils used in making up the colors and lacquers thoroughly clean, and the most rigid observance of all details must be adhered to in order to secure satisfactory results.

Prizes for Electroplaters

Announcement of the Awards for Technical Papers Made at the Rochester Convention of The American Electroplaters Society

THE decisions of the Committee on Awards of the A. E. S. made at the Rochester Convention, June 29-July 2, which reached us too late to be included in our July issue, were as follows:



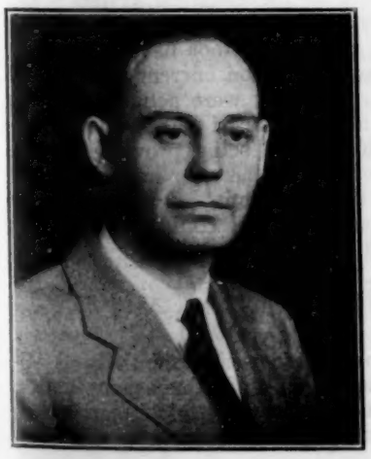
WALTER S. BARROWS

Toronto Branch

Winner of Founder's Gold Medal for 1931

Founder's Gold Medal: Walter S. Barrows, Toronto Branch, for the pages, "Protective Value of a Copper Strike."

First Certificate Award: Jacob Hay, Chicago Branch, for the pages, "Chromium Plating."



C. E. MARKER

Newly-Elected Second Vice-President of the American Electroplaters' Society

Second Certificate Award: Walter Lockerbie, Chicago Branch, for the pages, "Effects of Acids and Alkalies."

Third Certificate Award: Arthur E. Thurber, Rochester Branch, for the pages, "Commercial Control of Silver Plating."

Honorable Mention: H. C. Pearce, Indianapolis Branch, for the pages "Cadmium Plating"; **Oliver J Sizelove,** Newark Branch, for the pages, "Gold Solutions."

The first prize for exhibits was awarded to the **Wilmot Castle Company,** Rochester, N. Y., **Harry Puffer** in charge. The second prize went to the **Robeson Rochester Company,** Rochester, N. Y., **William Felton** in charge; third prize to **C. M. Hall Lamp Company,** Detroit, Mich., **Joseph Hansjosten** in charge.

High-Strength Electrical Conductor

A subscriber writes asking for a suggestion as to the composition of a non-ferrous alloy which will have an ultimate tensile strength of 40,000 pounds and at the same time show an electrical conductivity of 20 to 30 per cent.

Not many of the copper alloys can be guaranteed to have a tensile strength of 40,000 pounds or more in the cast condition, and most of the stronger alloys have rather low electrical conductivities. The outstanding exception appears to be manganese bronze. Manganese bronze, skillfully alloyed and cast, has a tensile strength of from 75,000 pounds up to as high as 100,000 pounds or even more, and an electrical conductivity of about 25 per cent. As every foundryman knows, this alloy is tricky, and both the tensile strength and conductivity may vary widely depending upon the exact composition and upon the practice used in melting and casting.

We know of no other copper alloy which could be recommended to meet this requirement. Among the aluminum alloys, duralumin has been cast with a conductivity claimed to be as high as 40 per cent and a tensile strength of 35,000 to 40,000 pounds. The tensile strength can be substantially increased by heat treatment, but we cannot say what effect this might have on the electrical conductivity.

H. M. St. John.

Correcting Engravings by Projected Electrolyte

By WILLIAM E. BAILEY
Formerly of the Bureau of Standards, Washington, D. C.

Building Up or Stripping a Copper Plate by Spraying a Solution Through Which Is Run a Direct or Reverse Current

ONE of the outstanding advantages of copper plates in the process of production of oceanographic and terrestrial charts is the permanence of the record thus made, and its security from fire and other damage. But this very permanence has itself constituted a serious disadvantage. For, if a sand-bar shifts, or new soundings necessitate the insertion of new values for water depths, or a harbor shore line or a railroad is straightened, all of the methods hitherto existing have afforded no quick means of effecting erasure of the consequent incorrect areas on the copper plate.

An expensive and time consuming method of making such corrections is the one by which an alto is deposited upon the copper chart plate. This requires some days for the copper to deposit. Having been previously treated with some separating medium, as a silver nitrate solution, the copper basso or printing plate will allow the alto to be separated; the engraved lines of the basso are then in relief on the alto plate, and the engraver can scrape them off readily. A new basso or printing plate is then made by electrolytic deposition on this alto. After proper preparation, the copper plate thus produced can be re-engraved in accordance with the revised data.

A number of alternate methods have been proposed and tried. Another successful but laborious procedure is the one by which the incorrect data is scraped off or ground from the copper plate, after which the plate is bumped up from the back, polished, and re-engraved. Still another method is that of etching with acids after applying asphalt or other suitable "stop-off" insulation to the nearby areas. In addition to offering grave difficulties of control, the method requires considerable time. The etching action, too, tends to be uneven within the exposed area, and to undercut in deep ridges at the borders of the insulation. All the methods heretofore proposed require special technique, and are laborious and time-consuming, and therefore expensive.

A discovery made a few years ago, however, provides an inexpensive, quick and accurate method of making these corrections. It had been found that when a projected stream of a copper plating salt solution, in electrical connection with an electrode, was directed at such a copper plate which had been made the anode or positively charged electrode, that copper could be removed from the plate at will, the etching action taking place at, and very closely adjacent to, the point of impingement of the copper solution on the plate. Conversely, by reversing the direction of the current through the system, the copper plate could be made the cathode, and copper could be deposited as readily; moreover, that such deposition would take place at, and very closely adjacent to, the point of impingement of the liquid, and not elsewhere.

By a coincidence, the U. S. Coast & Geodetic Survey made application to the Bureau of Standards for aid in their efforts to find an adequate method of chart plate correction, such request being made only a few weeks after the Patent Office had recognized the novelty of such a method of deposition. The present writer was assigned to carry on experiments, and saw at once that the new method of deposition probably offered the most possibilities. It was soon demonstrated that the process of correcting copper chart plates by a projected electrolyte was entirely feasible, as areas of several square inches could be reduced to a plane surface within a few minutes. Subsequently, after having first used a stream as obtained by air pressure into a carboy used as container for acid copper sulfate solution, a motor driven hard rubber pump was installed as regular equipment. A specially designed hard rubber hand tool was designed and made; in this hand tool an electrode was mounted which could be used either for anode or cathode. The current used was 110 volt D.C., passed through a carbon plate variable resistance.

In operation, the chart plate to be corrected is mounted on an easel, sloping so that the spent electrolyte will flow back by gravity to the container. No special plate preparation is necessary, as the stream will break down any surface film on the plate; but a very thin grease film will prevent the slight discoloration caused when the spent solution is allowed to run over a clean copper plate.

Experiments have indicated that the rapidity of the method is limited, for practical purposes, only by the capacity of the pump and of the electrical system. Because of agitation conditions present, current densities as high as 3,000 amperes per square foot have been used, and at the Coast Survey installation current densities of over 800 amperes per square foot were actually used on corrections. The hand tool there used was fitted with removable disks, the various disks being provided with a single aperture, or a plurality of them, or in the form of a slot. It was found that the limits of concentrations of copper sulfate and sulfuric acid could vary widely; usually approximately the following was used:

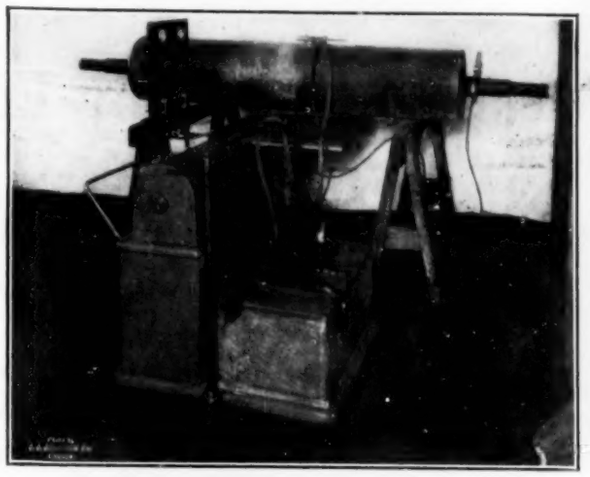
	g/L
$CuSO4—5\ H_2O$	150 to 200
H_2SO4	50 to 100

The actual operation is carried out substantially as follows: The plate is mounted on an inclined plane with a trough or tray to collect the spent electrolyte. It is then connected to the current source through a double-pole-

double-throw switch so that the direction of the current may be readily changed. Usually a voltage of fifteen (15) is sufficient. Unless paraffin or asphalt or other heavy film is on the plate no preliminary cleaning is necessary. The stream of electrolyte is projected against the plate which is made the anode, and copper is removed electrolytically from the plate and deposited on the electrode of the hand tool. Ink left within the lines of the plate may even be an advantage, as such ink tends to remain until the adjacent surface is flush with the bottom of the engraved lines, when the ink is flushed off by the force of the stream. At this stage the current is reversed and copper deposited on the plate, the latter being in perfect condition, without any cleaning operation whatever, to receive a firmly adherent coat of copper. Copper is then allowed to deposit to the required depth, the average depth of an engraved line on such plates amounting to about one-twenty-fifth of the thickness of the plate. The plate is then washed off, dried and polished, and is then ready for the engraver to insert the new detail.

A variation from the above is possible, as where it is desired to engrave in hammered copper. The copper is removed from the plate as before, whereupon the plate is washed off and dried, bumped up on an anvil, and copper then deposited on the back of the plate.

Aside from the rapidity of such corrections by this new method, the process is advantageous because of its simplicity. Any intelligent messenger boy can be taught to make corrections by this method within a few hours, thus adding the additional advantage of economy in labor costs.



Spot Plater

World's Platinum Output Facilities Greatly Expanded

By A. EYLES

ESTIMATES generally considered reliable place the world's requirements of platinum and platinum-group metals at about 400,000 ounces per year. On the basis of this estimate, a new refinery recently opened at Acton, England, by the Mond Nickel Company, Ltd., is capable of supplying three-fourths of the world's need for this group of precious metals. The Acton Precious Metals Refinery, as this plant is known, was first put in operation in 1924, with a producing capacity of some 40,000 ounces per year. Ore was formerly obtained almost wholly from Russia, South America and South Africa. Now, however, the world's chief supplies of the ore from which platinum, palladium, ruthenium, iridium and osmium are obtained lie chiefly in Ontario, Canada, and at Clydach, South Wales. The metals are roughly extracted from the ores near the source and sent to Acton for refining and separation. They are finally cast into ingot form for industrial purposes.

The demand for platinum for industrial use, as distinct from its uses in jewelry, has increased greatly in recent years, owing partly to the development of various new crafts and applications. One firm which manufactures platinum ware sells laboratory apparatus and utensils of this precious metal to mines and for surgical work; it makes spinnerets for producing artificial silk; platinum gauze and salts are needed in chemical plants; and the same company makes contacts for magnetos and distributors for automobiles and aircraft motors.

Qualities in the metal which appeal particularly to metallurgists, chemists and metal workers include a very high fusing point, extreme ductility, malleability, resistance to oxidation even at very high temperatures, and immunity from attack by sulfuric, hydrochloric or nitric acids. Such qualities invest it with great value in the manufacture of chemicals, and in scientific apparatus, as exemplified, for instance, in its use as a container for radium, in treatment of cancer.

Like gold and silver, platinum, besides possessing outstanding qualities for particular forms of productive industry, is of much value in jewelry, where its color, resistance to tarnish and extremely fine working qualities make it highly desirable as a setting for precious stones. Expert judges often find the effect of a fine stone is spoiled by the yellow light reflected by a gold setting or an adjacent gold ring. Platinum settings are considered particularly suitable for settings of diamonds and pearls, and gold rings are often electroplated with platinum to give them the better appearance of the more precious metal.

The use of the metal for jewelry was largely responsible for a sharp rise in the price of platinum after the World War, during which much of the metal had been used in munitions manufacture, at prodigious cost. After the war, with the withdrawal of wartime restrictions as to its use, platinum was in large demand by jewelers in New York, London and Paris, to supply a very heavy call for their wares. The only means of preventing exhaustion of the limited stocks obtaining at the time was considered to be the raising of the prices to a high level. Since then prices have declined considerably.

Metal Polishing by Flexible Polishing Wheels

By EDWIN M. BAKER and GEORGE E. HOLBROOK

Associate Professor of Chemical Engineering, and Member of the Department of Chemical Engineering, Respectively, University of Michigan, Ann Arbor, Mich.

Apparatus Which Was Designed and Built at the University of Michigan for Experimental Study of Metal Polishing by Flexible Polishing Wheels—General Procedure of Laboratory Tests, and Experimental Data Which Were Obtained—Part I.

A PAPER PRESENTED AT THE FIFTY-NINTH GENERAL MEETING OF THE ELECTROCHEMICAL SOCIETY HELD AT BIRMINGHAM, ALA., APRIL 23, 24 AND 25, 1931.

IN many cases, the plating of metals is preceded by a polishing operation in which a flexible polishing wheel is used. For some time there has been evident the need for the solution of the numerous and complex problems involved in commercial metal polishing. A careful scrutiny of the literature indicates a dearth of information on this subject. No laboratory apparatus has been developed which might aid in the study of such problems, as for example, finding the optimum pressure to be applied to the polishing wheel, or measuring the effect of grain screen analysis upon the performance of the wheel.

In order that problems such as these might be studied in a scientific manner, we designed and built a small polishing apparatus which could be used in the laboratory. With this apparatus numerous tests could be carried on with fair accuracy, and with a minimum expenditure of materials. These results were obtained with flexible wheels, and the conclusions do not necessarily apply to rigid wheels.

Apparatus

A diagram of this machine is shown in Fig. 1. It consists essentially of a shaft driven at a speed of 5,900 r.p.m. Mounted on the end of the shaft is a polishing wheel approximately five inches (12.5 cm.) in diameter by 0.25 in. (6 mm.) wide. The peripheral speed of the polishing wheel was 7,000 feet (2,140 meters) per minute. The steel to be polished was supported on an arm which was given an oscillating motion so that the steel was moved under the polishing wheel.

The movable arm was held up to the polishing wheel by means of a rubber balloon or football bladder, supported on a scale arranged to show the pressure on the wheel at all times. Distinction was, of course, made between the gross weight on the scales and the net weight, which is the pressure between the polishing wheel and the steel on which it is working. The pressure can be adjusted at will either by inflating or deflating the balloon.

Test Wheels

The other main part of the apparatus is the wheel, which really is the actual test specimen. It has been found that wheels cut from a section of a buffing wheel and subsequently stiffened by impregnation with glue have about the same characteristics as the polishing wheels actually used in commercial practice.

The wheels were cut from sections of buffing wheels and the threads on the periphery were ripped so that the outer edge would be loose and flexible. To give the wheels the required stiffness, they were then impregnated under vacuum with a warm 30 per cent solution of glue. The excess glue was removed by spinning the wheels on the shaft of a motor.

After thoroughly drying, the wheels were carefully

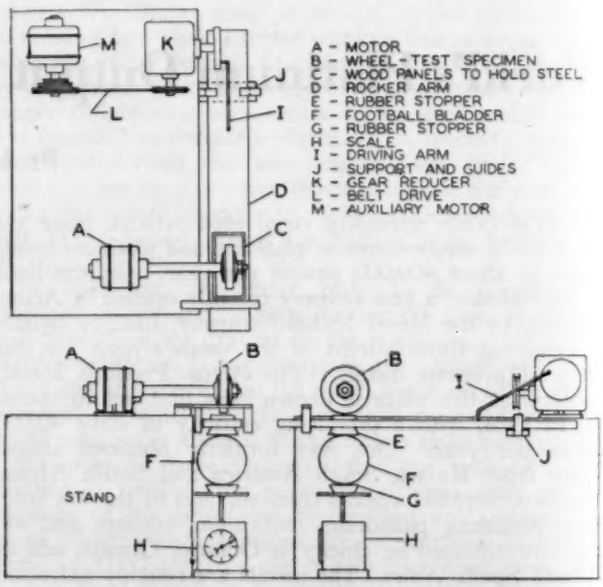

A - MOTOR
B - WHEEL - TEST SPECIMEN
C - WOOD PANELS TO HOLD STEEL
D - ROCKER ARM
E - RUBBER STOPPER
F - FOOTBALL BLADDER
G - RUBBER STOPPER
H - SCALE
I - DRIVING ARM
J - SUPPORT AND GUIDES
K - GEAR REDUCER
L - BELT DRIVE
M - AUXILIARY MOTOR
STAND

Fig. 1. Experimental Polishing Apparatus

trimmed to give a fairly smooth periphery. They were uniformly about 6 mm. thick at the edge. The final step in the preparation of the wheels was the spreading of a thin layer of glue on the periphery and on the edges of the wheels. This was done with a small paint brush. This procedure is commonly known in industrial circles as "glue sizing."

Preparation of the Wheels for a Test

It must be understood at the outset that the thing being tested is the actual polishing performance of the glue and grain aggregate on the periphery of the wheel. It is im-

portant, therefore, to know and control all the variables which determine the characteristics of this aggregate and consequently affect the performance of the wheel.

These factors, listed in the order in which they are encountered, are: (1) Characteristics of glue used. (2) Concentration of glue solution. (3) Length of time that glue is soaked previous to melting. (4) Temperature at which glue is melted. (5) Length of time glue is held at melting temperature. (6) Temperature of glue when it is applied to the wheels. (7) The amount of glue applied to the wheels. (8) Kind of abrasive used. (9) Size of abrasive used and its screen analysis. (10) Temperature of grain at time of application to wheel. (11) Method of application of grain on the wheel. (12) Subsequent treatment of wheel previous to test. (13) Temperature and humidity of air during the drying process. (14) Length of drying time.

The following procedure was followed in these experiments. A weighed quantity of glue was mixed with the required weighed quantity of water, and soaked for 1.5 hours in covered beakers at 25° C. After soaking, the mixture was transferred to a large stoppered test tube and heated in a constant temperature bath to 60° C. for 30 minutes. The glue solution was then applied to the periphery of the wheel by means of a small brush, and the wheel was rolled in the abrasive grain which was held in a small rectangular pan.

The wheel and grain were previously heated to 60° C. in an ordinary laboratory drying oven. After rolling 30 seconds in the grain, the rolling was completed on a clean flat surface to produce a smooth surface on the wheel. The wheel was then dried for two hours, and a second glue and grain coat were applied. After a further two hours' drying, a thin film of glue was applied evenly to the periphery and edges of the wheel. This operation is designated by us as "top-dressing." The wheel was further dried for approximately 20 hours, and was then tested. The drying temperature was approximately 26° C. and the relative humidity was 60 per cent.

Criteria of Performance

After the wheels have been prepared as outlined above, the remaining laboratory work is the performance test itself. The criteria of performance must be defined before the actual test procedure is outlined. Since the solution of any commercial polishing problem is ultimately judged on the dollar basis, it is quite evident that two distinct and somewhat conflicting factors are always involved in any analysis. One factor is the cost of material and the other is the cost of the time required for the polishing operation. The conclusions of this paper are based on the amount of steel removed in the polishing operation, and not upon the degree of polish obtained. The latter subject will be discussed in a subsequent publication.

Glue and Grain Efficiency

The first factor is the cost of glue and grain used in doing a definite amount of polishing. This is a measure of glue and grain efficiency and can be expressed as the ratio of the grams of steel removed from the steel bar to the grams of "wheel wear," or to the grams of glue and and grain removed from the wheel during the polishing operation.

This ratio, which will be referred to as "efficiency," was determined in the following manner: The wheel and the steel being polished were weighed just before and again just after the actual polishing test. The loss in weight of the wheel due to the removal of grain and glue from the periphery, or the wheel wear, divided into the loss of weight of the steel being polished was taken as the wheel efficiency.

Cutting Speed

The second factor is the time required to do a given polishing job. In commercial practice, labor, interest, depreciation and power are all affected by a change in the cutting speed of the polishing wheel. In the laboratory tests, the cutting speed could be expressed as the grams of steel removed per minute per inch width of the wheel.

This criterion of cutting speed would be satisfactory if both the total force applied to the wheel through the bar

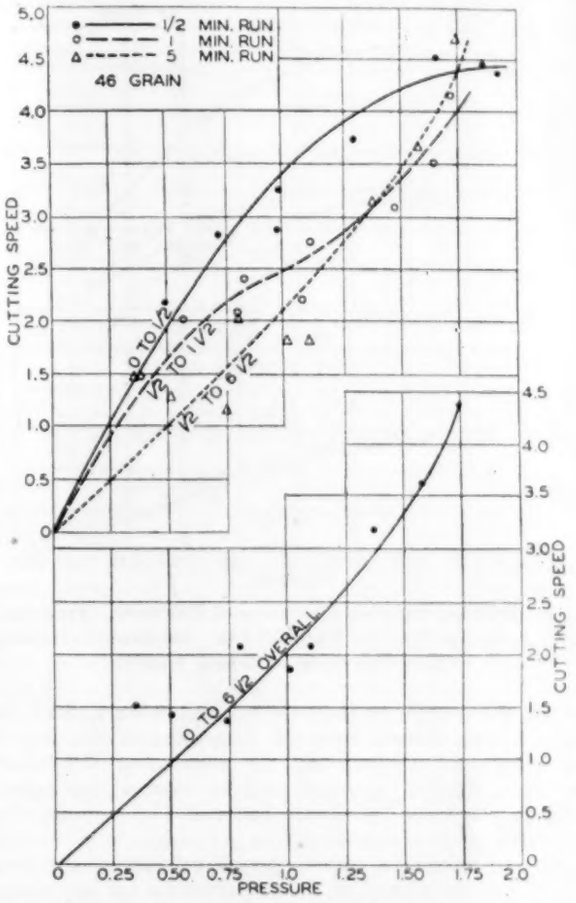


Fig. 2. Relation Between Cutting Speed and Pressure. Cutting Speed in Grams of Steel Per Minute Per Cm. Width of Cut. Pressure in Net Force in Kg. Per Cm. Width of Cut

of steel and the effective cutting area of the wheel were constant for all wheels and all tests, in which case the force or pressure per unit of area would be constant. Since it has been established through experimental results, that within the range of commercial pressures the cutting speed varies almost directly with the pressure, it is evident that a correction must be applied if either the total applied force or the effective area is not constant.

One dimension of the effective cutting area is substantially constant because the wheels are all the same diameter, but the other dimension or width of the wheel would vary somewhat with the different wheels. Since one dimension of the effective area is constant, the "net pressure" can be expressed as pounds per inch (or kg./cm.) width of the wheels.

The "cutting speed" is here defined as the steel removed per minute, per cm. width of the wheel, per kilogram of net pressure. This definition is fundamental and for that reason is used in spite of the fact that in the actual calculation of cutting speed, the width of the wheel can be cancelled, and, therefore, the cutting speed could be expressed

as the grams of steel removed per minute per kilogram of net force applied.

Performance Tests

It was found desirable to interrupt the tests at short time intervals in order to trace the change in the perform-

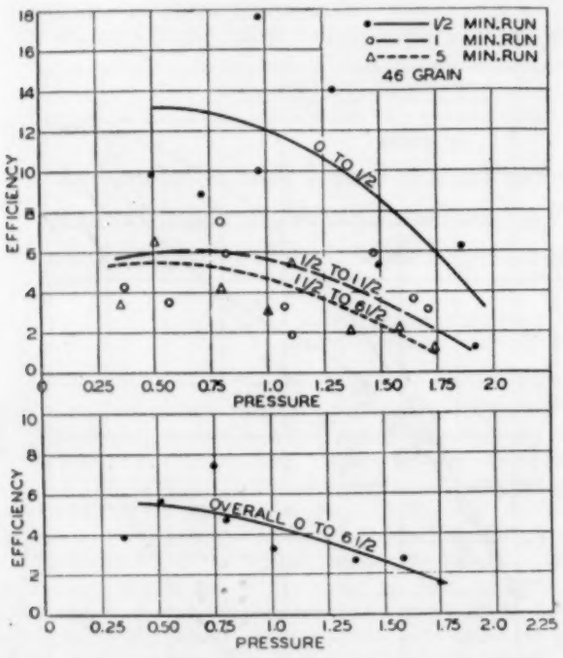


Fig. 3. Relation Between Pressure and Efficiency. Pressure in Net Force in Kg. Per Cm. Width of Cut. Efficiency in Grams of Steel Per Gram of Wheel Wear

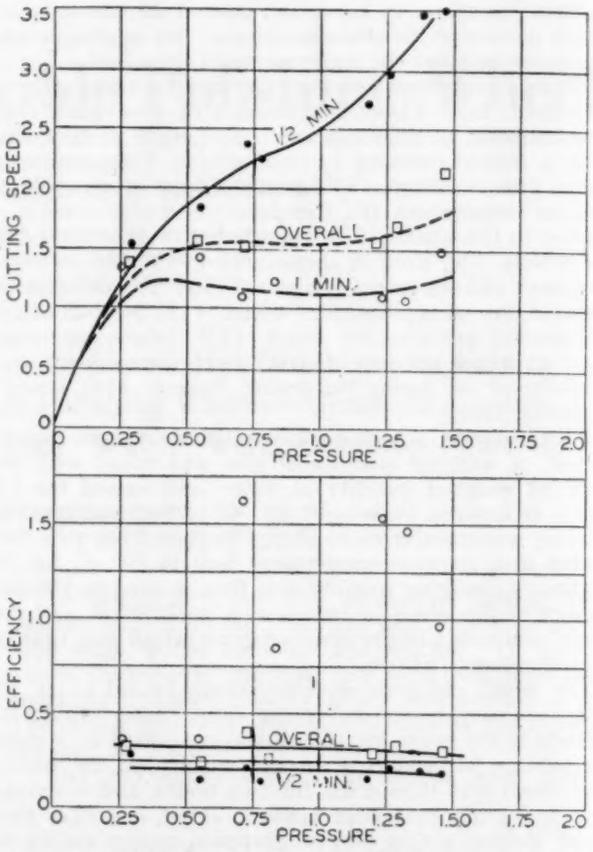


Fig. 4. Relation Between Pressure and Cutting Speed and Between Pressure and Efficiency—150 Grain. Cutting Speed in Grams of Steel Per Minute Per Cm. Width of Cut. Pressure in Net Force in Kg. Per Cm. Width of Cut. Efficiency in Grams of Steel Per Gram of Wheel Wear.

ance of the wheels as they were being worn down. The time intervals chosen were the first one-half minute, the succeeding one minute, and the succeeding five-minute intervals. At the pressures used in most of the experiments by the time the wheels had run 11.5 minutes they had ceased to give representative performance.

The data taken, of course, permit calculating the overall performance as well as the performance for the various intervals chosen. To those unfamiliar with commercial polishing it may be surprising to note that roughing wheels (set up with the coarser grades of grain) may be run only about 15 to 30 minutes of actual polishing before they are worn out and need to be again set up. Finer wheels last much longer, usually several hours. Wheel life depends on the pressure, as will be evident from some of the following data.

Fig. 2 presents the results of experiments in which the wheels were set up with two coats of No. 46 grain, using a properly prepared 30 per cent glue solution. After the wheels were set up with the two grain coats, they were given a thin coating of 25 per cent glue solution. Four curves are presented showing the performance of wheels at different pressures during the first half minute of the life of the wheel, the subsequent one minute, the subsequent five minutes, and the first six and one-half minutes.

The latter curve, therefore, represents the average performance, whereas the first three curves represent the performance during the time increments indicated. While the data do not in each case accurately define a smooth curve, the trends are none the less definitely established. It will be noted that the cutting speed increases approximately directly with the pressure exerted between the wheel and the work to be polished. Doubling the pressure will, therefore, approximately double the cutting speed.

Fig. 3, representing the same experimental runs as portrayed in Fig. 2, shows a plot of efficiency against pressure. Efficiency is defined for the purposes of this paper as the grams of steel polished away per gram of wheel

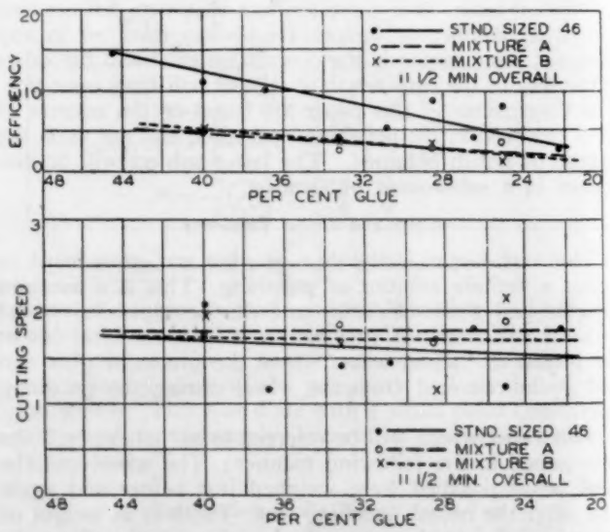


Fig. 5. Relation Between Grain Screen Analysis and Efficiency and Between Grain Screen Analysis and Cutting Speed. Cutting Speed in Grams of Steel Per Min. Per Cm. Width of Cut at Unit Pressure. Efficiency in Grams of Steel Per Gram of Wheel Wear.

wear. The results shown in Fig. 3 are somewhat more erratic than those in Fig. 2. It will be noted, however, that when the pressure is in excess of 0.75 to one kg./cm. width of cut the wheel efficiency decreases rapidly with increased pressure.

Doubling the pressure from one kg. to two kg., for instance, would mean that the life of the wheel at two kg. would be around 25 per cent of the life of the wheel at one kg. In other words, by using a pressure of one kg.,

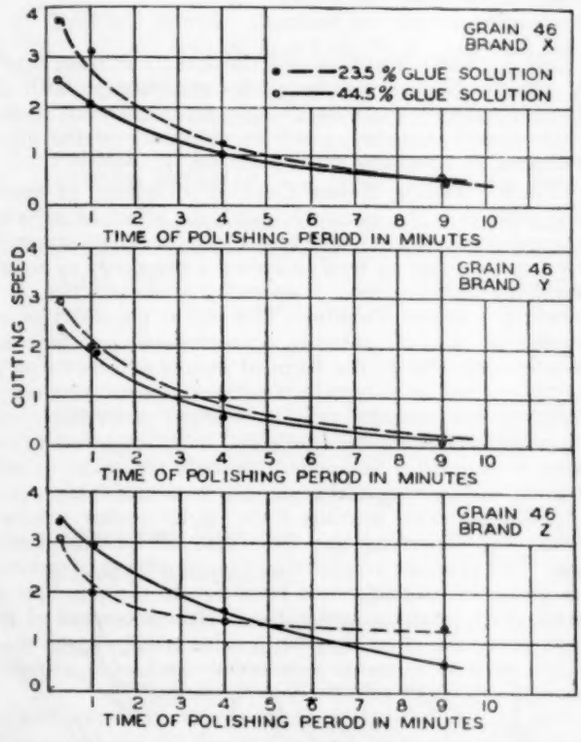


Fig. 6. Relation Between Time of Polishing and Cutting Speed. Cutting Speed in Grams of Steel Per Minute Per Cm. Width of Cut.

four times as many pieces could be obtained per wheel as with two kg. By referring again to Fig. 2, it is evident that the speed at which the polishing could be done would be only half as fast at one kg. as at two kg.

Fig. 4 presents data similar to those portrayed in Figs. 2 and 3, except that the grain used was No. 150, which was set up with 26.6 per cent glue and given a top-dressing of 7.8 per cent glue. It will be noted that an increase in pressure only slightly decreases the efficiency and that except for the first half minute of polishing, an increase in pressure beyond 0.5 kg./cm. width of cut has very little effect on the cutting speed.

Grain was sifted through a set of silk screens which were known to be reasonably accurate. All of the grain retained on the No. 46 sieve was designated as standard size No. 46. Mixtures designated as A and B were made by mixing quantities of the material retained on the indicated sieves to give the following compositions:

	Material Retained on Sieves	
	Mixture A	Mixture B
Screen Size	Per cent	Per Cent
46	40	60
54	20	30
60	15	
70	10	
120	10	10
180	5	

Wheels with these difficult mixtures were set up using different concentrations of glue. These wheels were also

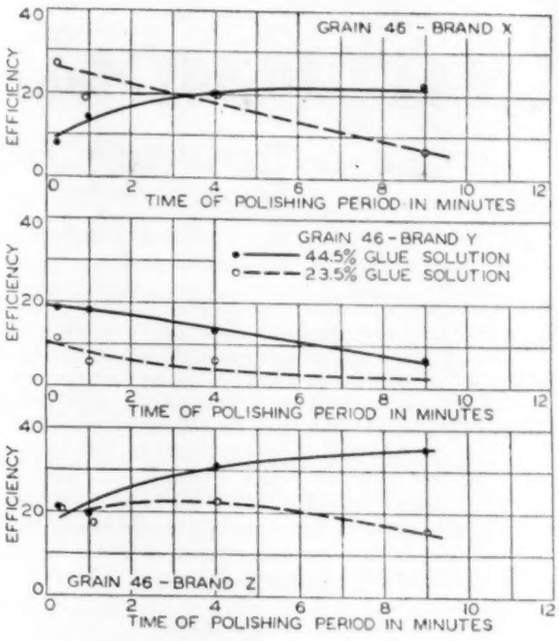

GRAIN 46 - BRAND X
EFFICIENCY
TIME OF POLISHING PERIOD IN MINUTES
GRAIN 46 - BRAND Y
44.5% GLUE SOLUTION
23.5% GLUE SOLUTION
GRAIN 46 - BRAND Z

Fig 7. Relation Between Time of Polishing and Efficiency. Efficiency in Grams of Steel Per Gram of Wheel Wear.

given a top-dressing of 25 per cent glue. The experiments were run at a constant pressure of 0.86 kg./cm. width of cut.

It will be noted that within the accuracy of the experiments, the sizing had relatively little effect upon the cutting speed. It did, however, make a great difference in the efficiency. Using 40 per cent glue, two and one-half times as many pieces could be obtained with this closely sized grain as could be obtained with the same amount of wheel wear when using either mixture A or B. The same general comparison holds for any other concentration of glue.

The performance of polishing wheels changes as they are being used. The change in the cutting speed and efficiency with time of polishing is shown in Figs. 6 and 7 for three different brands of No. 46 polishing grain. Curves are shown for two concentrations of glue in each case. Results for intermediate glue concentrations lie in general between the results for the curves plotted, which show both a rather dilute glue and a rather concentrated glue.

It will be noted that in all cases the speed of polishing decreases rather rapidly during the first few minutes that the wheel is used, and levels off to rather steady performance which may continue until the wheel is worn down to the canvas. It will be noted, however, that all of the brands of grain do not perform alike. At the end of a 10-minute interval, for example, brand Z, using the more concentrated glue, is decidedly superior in cutting speed to brands X and Y.

It is not possible to so generalize about the change in efficiency with time of polishing. Brand Z in Fig. 7 shows little change in efficiency with the dilute glue, but a noticeable increase in efficiency with the concentrated glue. Brand X shows a decrease in efficiency with the dilute glue. The efficiency also increased with time when the concentrated glue was used. In general with the dilute glue, which does not hold the grain in place with sufficient tenacity, the efficiency is apt to decrease as the wheel is used.

This paper will be concluded in an early issue.—Ed.

Ingot Makers Adopt Code

Trade Practice Rules of the Ingot Brass and Bronze Industry Approved and Accepted by the Federal Trade Commission on May 29th, 1931

R. D. T. HOLLOWELL, Secretary, Trade Practice Committee of the Ingot Brass and Bronze Industry, stated July 23, 1931, that that industry had recently received from the Federal Trade Commission revisions of the rules which were adopted by that industry at a Trade Practice Conference on February 6th, 1930, at Washington, D. C.; that these revisions as approved and accepted by the Federal Trade Commission, were submitted to a recent conference of smelters representing more than two-thirds of the country's entire production of ingot brass and bronze with the result that the revisions were unanimously approved and accepted. The rules are now in effect.

GROUP ONE RULES

Rule 1. **Defamation of Competitors:** The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of the grade or quality of their goods, with the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair practice.

Rule 2. **False Statements.** The making or causing or permitting to be made or published any false, untrue, or deceptive statement by way of advertisement or otherwise concerning the grade, quality, quantity, substance, character, nature, origin, size, or preparation of any product of the industry having the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice.

Rule 3. **Imitation of Trade-Marks, Etc.:** The imitation of the trade-marks, trade names, slogans, or other marks of identification of competitors, having the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice.

Rule 4. **Enticing Competitor's Employees:** Maliciously enticing away the employees of competitors with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their businesses, is an unfair trade practice.

Rule 5. **Inducing Breach of Contract:** Maliciously inducing or attempting to induce the breach of existing contracts between competitors and their customers by any false or deceptive means whatsoever, or interfering with or obstructing the performance of any such contractual duties or services by any such means, with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their businesses, is an unfair trade practice.

Rule 6. **Commercial Bribery:** Directly or indirectly to give or permit to be given or offer to give money or anything of value to agents, employees, or representatives of customers or prospective customers or to agents, employees, or representatives of competitors' customers or prospective customers, without the knowledge of their employers or principals, as an inducement to influence their employers or principals to purchase or contract to purchase industry products from the maker of such gift or offer, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors, is an unfair trade practice.

Rule 7. **False Marking of Products:** The false marking or branding of products of the industry, with the effect of misleading or deceiving purchasers with respect to the quantity, quality, grade or substance of the goods purchased, is an unfair trade practice.

Rule 8. **Selling Below Cost:** The selling of goods below cost with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice.

Rule 9. **Secret Rebates:** The secret payment or allowance of rebates, refunds, commissions, or unearned discounts, whether in the form of money or otherwise, or secretly extending to certain purchasers special services or privileges, not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair practice.

Rule 10. **Coercing the Purchase of Several Products:** The practice of coercing the purchase of several or a group of products, as a condition to the purchase of one or more products under the exclusive control of the seller, where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice.

Rule 11. **Substitution of Products:** The practice of shipping or delivering products which do not conform to the samples submitted or representations made prior to securing the orders, without the consent of the purchasers to such substitutions, and with the effect of deceiving or misleading purchasers, is an unfair trade practice.

Rule 12. **Fictitious Prices:** Offering for sale merchandise at a price reduced from a marked-up or fictitious price with the tendency and capacity to mislead or deceive purchasers or prospective purchasers is an unfair practice.

GROUP TWO RULES

Rule 1. **Use of Accurate Cost Finding Methods:** It is the judgment of the industry that each member should install a proper method for determining his cost.

Rule 2. **False Records:** Withholding from, or inserting in, an order or an invoice, statements which make the order or invoice a false record, wholly or in part, of the transaction represented on the face thereof, is condemned.

Rule 3. **Price Lists: Terms of Sale Should be a Part of:** (a) The industry approves the practice of each individual member of the industry independently publishing and circulating to the purchasing trade its own price lists. (b) The industry approves the practice of making the terms of sale a part of all price schedules.

Rule 4. **Standard Form of Contract:** It is the judgment of this conference that the industry should adopt in cooperation with buyers a standard form of contract which will protect the rights of both buyers and sellers.

Rule 5. **Committee on Trade Practices Authorized:** A Committee on Trade Practices is hereby created to cooperate with the Federal Trade Commission and to put these rules into effect.

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Editorial

Advancing Electroplaters

THE 19th annual convention of the American Electroplaters' Society held in Rochester, N. Y., June 29-July 2, 1931, brought to light and showed clearly the underlying strength and the progressive attitude of that organization. Its membership record alone would be ample proof. In a year of extreme depression, from June 1, 1930, to June 1, 1931, the membership of the Society increased from 1549 to 1586; in other words, growth during a year when many other similar organizations were falling behind.

But there is further evidence in the round table discussion held on Electroplating in General. A report from the Baltimore-Washington Branch showed that platers' classes have been held for three years. These classes have been instructed in chemical analysis of electroplating solutions. Now that this course has been completed, what is the reaction of the members? Are they satisfied that they know enough? Are these classes to be discontinued? On the contrary. The members came to the leader of the class and said, "We have learned now something about how to run analyses and chemistry; we can run through these directions if the directions are complete; we can pour in this and titrate with that. But we want to know what it is all about; we don't understand why; we are carrying out these directions mechanically because you told us to do it. You told us that we should add this and that and we should calculate this, and that is very helpful and useful but we don't know why." Consequently they are planning next year for a series that will be more lectures than laboratory work, in which will be explained the simple elementary principles of chemistry which they have been using all along in running their solutions. This will be followed up by electrochemistry, explanations of electrolysis, polarization and anode and cathode efficiencies, etc.

It was pointed out with good effect, that in these classes, the lectures must be given with an understanding of the students. In other words, they should be phrased simply and the students led carefully and slowly into the more abstract and obstruse fields of theory. Even chemical symbols have to be used with care in order not to confuse the uninitiated.

A number of other steps in the direction of progress were noted. It was suggested that certificates be issued to those who complete a three-year course in chemical analysis, these certificates to be limited perhaps to those who made a satisfactory performance in an examination severe enough to test them properly. It was advised that regular, paid instructors be procured for these classes so that the services rendered would be sufficiently high grade and interested enough to satisfy the demands of the platers.

It was pointed out among other things that good speakers are in demand at the branches throughout the country and it was recommended that the branches should procure these speakers, whenever possible, locally, from their own members, and thus develop the latent talent of which there is a considerable amount in the Society. When it is necessary or advisable to get speakers from a distance, the Society should pay their expenses in order to avoid being under obligation to the employers of the speakers.

It is not so much the individual suggestions or ideas, important and valuable as they may be. It is the general attitude of the Society which is inspiring. In the midst of a period of the hardest times we have had in a decade, and in the midst of discouragement in circles financially far above their own, the members of the Society are going ahead at full speed, pledging themselves to further research, undertaking increased individual and collective financial obligations in order that they may be better electroplaters and that they may make electroplating a better industry. The American Electroplaters' Society is setting a pace fully as fast as in any similar organization in the United States.

Foremen Platers Indispensable

ELECTROPLATING shops, small and large, have awakened to the need for and the value of chemical analysis for controlling solutions. The unremitting efforts of the American Electroplaters' Society, aided by the Bureau of Standards has borne fruit to such an extent that no progressive plating shop nowadays takes its solutions for granted, but has periodic analyses made regularly. There are now, moreover, a number of electroplating experts with experience and training in methods of analysis who serve plating shops too small to support chemical laboratories of their own.

This is, of course, all to the good. It shows that the plating industry is keeping in step with the times. But a rather strange by-product has accompanied this development. We are told of some expert analysts who in their offers to keep solutions in condition, make the statement that their work eliminates the need for foremen platers; that all the shop needs is boys or girls to rack the work and remove it from the tanks.

No words can be too strong in denying and refuting such claims. Chemical analysis is an indispensable aid to good electroplating, but chemical analysis alone can never replace the skilled, practical electroplater. No matter how good the consultant may be, his weekly or bi-weekly visits are utterly insufficient to keep a plant in shape, to check the work as it goes into the tanks and follow it through as it comes out. In some cases, work done without the aid of a practical plater may look well and may even pass muster for a while. But without the experienced hand and practiced eye of the practical plater, there is no certainty that the coating is sufficient. There are many things that can happen between the visits of the expert, and every manufacturer knows how expensive it is to have work returned to be stripped and replated.

It is not always feasible for the electroplater in the shop to do his own analytical work. He may be busy with routine. He may have to keep close watch on his helpers and the men under him. He has mechanical and electrical equipment and connections to watch. He must, in many cases, specify and even design the racks for special work. Given good assistance he can and does find time to analyze his solutions, but where it is not possible, it is perfectly legitimate to call in outside help for this type of work. But it is a delusion, dangerous and expensive, to think that periodic visits of the analyst can replace the practiced and watchful eye of the experienced man on the job. An electroplating shop is too delicate a department to leave to inexperienced hands. In these days when the finish and appearance play such a large part in the salability of a product, and when the public demands not only appearance but wearing qualities, it is penny wise and pound

foolish to the utmost degree to dispense with the foreman plater.

The American Electroplaters' Society has done wonderful work in educating its members to the latest and best practice in plating shop operations. It is now going forward steadily along the path of chemical analysis, the fundamentals of chemical reactions and general chemistry, all as applied to electroplating operations. Unlike a labor union (which it is not) the American Electroplaters' Society works along the lines of educating its members in their profession, leaving salary and other financial considerations entirely to the individual. In other words it puts them in the class of the professional or technical man. No such man can be replaced by the consultant or expert. He can be guided, helped and co-operated with, to the benefit of the organization which employs him—but not replaced.

It is a pleasure to add that there are, to our knowledge, electroplating experts rendering service in chemical analysis who specify clearly in assuming such contracts, that the plant must retain its plating foreman who is to work with the expert. This is the ideal combination.

Lacquer Prices and Quality

IN a previous issue, under the heading "'Lacquer Prices and Quality" we published a letter from a reputable lacquer manufacturer commenting on an article in our January issue which pointed out that the lacquer industry was suffering from indiscriminate, cut-throat and even "bootleg" competition. This manufacturer stated that he was in favor of setting up standards of quality and price for lacquers of various grades.

Since then we have numerous comments on both the article and the letter. All lacquer manufacturers recognize the viciousness of the present condition. All of them also would welcome the possibility of stabilizing the industry and preventing unfair competition. Most of them, however, feel that it would be impossible to standardize lacquers and the prices charged for them. They feel that improvement in business conditions will automatically bring with it improvement in business practices, but this is clearly, in many cases, a hope rather than a confident prediction. Almost without exception, however, our correspondents expressed their willingness to join in any movement which would improve conditions in the lacquer industry.

In the words of the writer of the original letter, we wonder whether the lacquer industry cannot find a Moses to lead it out of the price-cutting desert and place it in the Promised Land where it was several years ago. This is a direct challenge to the lacquer industry to produce a leader and co-workers who will co-operate fairly for the benefit of all, laying aside mutual distrust and suspicion. What a prosperous and useful industry it could be!

Patent Rights

IT has long been accepted as almost an axiom that one of the greatest stimulants of business enterprise is a patent system by which an inventor can gain for himself the profits resulting from the commercial exploitation of his discovery. It has also long been known, however, that our American patent system is far from perfect, affording in some cases inadequate protection and granting in others, such a monopoly as to strangle the industry in which the patent may be issued. There is a saying among those who have had experience with patented articles and processes, that a patent is only a license for a lawsuit and that no patent is really good until it has been thoroughly litigated. Thorough litigation in the American courts involves enormous expenditures of money and often years of time.

The electroplating industry is familiar with the suit which has been in the courts for several years in chromium plating. In this issue, on page 329, is a report of another suit which has been started in the lacquer industry. Through the reports in the daily press, the public is familiar with the many-fronted battle between the Radio Corporation of America and the independents. There are rumors also of impending lawsuits in rhodium plating.

There is without question a fundamental weakness in a system which permits patents to be issued and manufacturing operations to be begun on the assumption that these patents are valid, when they may be later overthrown, resulting in the waste of enormous sums of money. Add to this the fact that decisions are necessarily slow, with appeals from one court to another bringing about reversals and the loss of extremely valuable time, and it is no wonder that a statement is made like the one issued by E. J. Prindle, formerly president of the New York Patent Law Association, and now chairman of the Patents Committee of the American Engineering Council, in which he says:

"Because of the peculiar nature of the patent monopoly, the present system of appeals in patent infringement suits in the United States is the most inefficient, expensive and wasteful to be found anywhere. It is a deterrent to the production of inventions, and to the investment of capital in patents. Correction of this condition is by far the greatest need of our patent system."

No one denies the inventor of a process the right to reap profits therefrom. This includes also the purchaser of an invention, who has by paying for it, acquired the right to profit. Whether or not these rights go so far as to permit the owners of patents to monopolize an industry and to prevent its growth except through his own auspices is a question which has not yet been cleared up in the minds of the general public. Certainly there are many who feel strongly that special license agreements permitting the licensees to operate under specific patents but including special provisions to the effect that the licensees must use materials, parts, merchandise or supplies made only by the licensors, are wholly unfair and establish monopolies contrary to American business practice.

These are questions to be settled ultimately by the courts and they should be settled as fast as possible in a fashion broad enough and clear enough to prevent unnecessary litigation in the future. In addition, steps should be taken to speed up any unavoidable litigation.

Mr. Prindle has prepared a bill which provides for a Single Court of Patent Appeals sitting at Washington composed of a chief justice and six associate judges, all to hold offices during good behavior. This court is to have final jurisdiction of all appeals in patent cases from the Districts Courts of the United States and from the Supreme Court of the District of Columbia, both in interlocutory and final orders and decrees, jurisdiction of the United States Circuit Courts of Appeals in patent appeals being abolished. This Single Court of Patent Appeals would be next in rank to the Supreme Court of the United States.

This is a suggestion which comes from a reputable and authoritative source. However, whether this plan or any other is adopted, is not the point. The all-important fact is that our patent system is antiquated and our legal machinery is unable to handle patent work in a manner which American industry has a right to demand. The expense of repeated litigations accompanying the present system makes them impossible to the individual and constitutes a burden from which even the large corporations shrink. The improvement of our patent system is one of the crying needs of American Business.

New Books

Electroplating. By Samuel Field and A. Dudley Weill. Published by Sir Isaac Pitman & Sons, Ltd. Size 5 x 7½. 205 pages. Price, payable in advance, $2.

In recent years "not only has knowledge of the fundamentals been largely increased, but quite new aspects of the deposition of metals have passed the experimental stage and become established practice with every promise of greater advances yet to come." The object of the present book, therefore, is said to be "to review these advances in a simple form which will, it is hoped, appeal to the practical plater.

The first sixty-five pages are devoted to a discussion of the fundamentals of electrodeposition, the properties of the electroplating solution and the plant installation. The treatment throughout is much too advanced for the practical plater and in a number of instances ambiguous as well as incomplete.

The statement is made, for example, that "it is easy to calculate the thickness of deposit for definite current densities and time." The relationship between average thickness of deposit and average current density on the one hand, and local variations of both thickness and current density on the other hand are ignored entirely. (p. 17).

It is further stated "that to deposit 0.1 inch of copper with a current density of 20 amperes per sq. ft. will require eighty-nine hours, this assuming that the current is producing its full amount of metal" (p. 18). This is only true of an acid copper electrolyte operating at 100 per cent efficiency, but the reader is left to figure this out for himself.

That "the different rates of deposition largely control the nature of the deposit" (p. 19) is not necessarily true. Temperature, solution composition and addition agents may be equally important.

While it is recognized that practice in England and the United States differs in many respects, an American might question the appropriateness of a discussion of rectifiers in a book dealing with electroplating (p. 30-39) or the advisability of a greater sectional allowance for bus-bars than 500-750 amperes per sq. in. of cross section (p. 43), and why nichrome or similar materials are not considered as well as iron wire for resistance coils (p. 44). Furthermore, if equipment is to be discussed, limiting the types considered to those produced by one manufacturer detracts greatly from the value of the book.

In discussing the properties of electroplating solutions, it is stated that the solution should be of comparatively simple composition, but the primary reason for this simplicity, namely, ease of control, is not stressed. In fact, the only control discussed is colorimetric measurement of pH. No reference is made to chemical analysis throughout the book nor to its value in controlling plating variables.

The remaining 115 pages of the book are devoted to the preparation of the work prior to plating and a discussion of the deposition of copper, silver, gold, nickel, zinc, cadmium, chromium, iron, tin, lead, cobalt, and alloys of copper-zinc, lead-tin, and cadmium-silver.

The writer hesitates to cite the numerous instances where the text differs from what is true in American practice, since the book must essentially represent what is typical of plating practice in England. When, however, a nickel solution is recommended without any chloride or boric acid (p. 118), when a solution containing 10 oz. of nickel, 4 oz. of boric acid, 1.5 oz. of sodium fluoride, 0.5 oz. of sodium chloride to 1 gallon of water is suggested for depositing nickel prior to chromium (p. 130), when it is stated that anodes and solutions for brass plating may not be the same copper-zinc ratio (p. 180), and it is inferred that cast iron cannot be successfully brass plated, (p. 182), when no commercial bronze plating solutions are mentioned (p. 183), and when it is implied that the nickel plating of chromium is yet to be made practical (pp. 189-190), one naturally questions how sincere the effort to review the advances in electroplating may have been.

"Electroplating" by Samuel Field and A. Dudley Weill, will prove a disappointment to anyone acquainted with the earlier work of the senior author.—A. K. GRAHAM.

Standard Metal Directory, 1931, Atlas Publishing Company, Inc., 150 Lafayette Street, New York. 6 x 9¼ in.; 778 pages, price $10.

This is the sixth addition of this valuable compilation. The main list comprises the names, addresses, officers, and statements as to major equipment, products, output capacities, and metals consumed, of the steel and metal manufacturers of the United States and Canada. These are listed alphabetically by states and provinces. There are also separate lists of foundries with indication as to products, lists of rolling mills of various kinds; metal smelting and refining works; blast furnaces, ingot producers, and other steel and iron industries; die casters, stampers, metal merchants, scrap dealers and refiners, ferroalloy producers and sellers; and many other lists of specialized lines of trade and industry. It also contains considerable statistical and trade information. It is the only available work of its kind.

Technical Papers

Mechanism of the Atomization of Liquids, by R. A. Castleman, Jr., Bureau of Standards. Research Paper No. 281, U. S. Department of Commerce. Superintendent of Documents, Washington, D. C. Price, 5 cents.

A Method for Separation and Gravimetric Determination of Osmium, by Raleigh Gilchrist, Bureau of Standards. Research Paper No. 286, Department of Commerce. Superintendent of Documents, Washington, D. C. Price, 10 cents.

British Standard Specification for Brazing Solder. British Engineering Standards Association, 28 Victoria street, Westminster, London, S. W., England. British Standard Specification No. 263; new edition which includes additional grades solder in form of slittings and wire, designated as "AA." Price, 2s, 2d, postpaid.—A. E.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, applications should be made to the governmental body responsible for the publication.

Abrasive Grain Sizes. Division of Simplified Practice, Bureau of Standards. Recommendation R118-30, covering allowable limits for sizing of aluminum oxide and silicon carbide abrasives for polishing and grinding wheel manufacture. 5 cents.

Wire Insect Screen Cloth Simplification. Division of Simplified Practice, Bureau of Standards. Advance sheets giving report of general conference on this subject. A printed book will shortly be available.

Federal Brass Specification. Federal Specifications Board, Washington, D. C. Proposed Revision, F. S. No. 392, superseding USGMS 392, March 1, 1926. Covers commercial brass bars, plates, rods, shapes, sheets and strips. Available from the Board.

Federal Copper Specification. Federal Specifications Board, Washington, D. C. Proposed Revision, F. S. No. 467, superceding USGMS 467, January 25, 1927. Covers copper bars, plates, rods, shapes, sheets and strips. Available from the Board.

Federal Specification for Anti-Friction Metal Castings and Ingots. Federal Specifications Board, Washington, D. C. Proposed Revision F. S. No. 536. Interested parties are requested to comment before mid-September. Copies available from Board.

Hack-Saw Blade Simplification. Division of Simplified Practice, Bureau of Standards. Sheets giving report of second revision of Simplified Practice Recommendation R90-29. A book will be available after the simplification program is approved by the industry.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

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Bright Brass Dip

Q.—I am especially interested in dipping brass castings and putting a bright finish upon same. We have been so far using the customary acid dip with washings to accomplish this but would appreciate any information which you may have upon this matter.

A.—Dipping brass or pickling is intended to remove oxide from the metal. The object is to render the surface clean, bright and uniform in color. Usually a strong sulphuric and nitric acid are used, and the time of immersion very short. Sheet brass must be free from holes or streaks and homogeneous in structure. Castings must be free from sand or other adherent matter. Any liquidation of the metal, due to improper melting, forms a composition not readily attacked by the acid and different color is the result. Lead will often liquidate and spot out. Unalloyed iron often shows after dipping. Antimony will also give trouble.

Bright acid dips, according to most text book formulae should be prepared in the proportions of 1 part sulphuric acid to half part aqua fortis. These proportions work very well after the bright dip has been working for some time and needs replenishing, but such a dip, when newly prepared according to the proportions mentioned, produces an Ormolu tone to the surface.

Bright dips for brass give better results when prepared from the following proportions:

Oil of vitriol	1 gallon
Aqua fortis	1 gallon
Muriatic acid	2 ozs.
Water	1 quart

For gilding metal, copper or low brass, 2 parts aqua fortis to 1 part of vitriol should be used by measure. Add the muriatic acid and water in the proportions mentioned.

A small handful of salt is sometimes added, or 1 or 2 ozs. lamp black. W. J. R., Problem 5,016.

Bright Plating

Q.—We are interested in obtaining information as to whether or not it is possible to plate such articles as we are sending you under separate cover, so that when finished, the bulb will give the impression that it is colored, without us going to this operation.

Of the assembly we are sending, the bulb is the only part that is polished, the armor and the capillary having a plain white nickel finish. We would like to put on only about a ten-minute nickel plate to run in production quantities.

A.—We doubt very much if you will be able to produce a finish on sample submitted that will be satisfactory without any polishing operation.

If it were not for the soft solder that is on the work, it could be bright dipped, then nickel plated, and the nickel deposit colored. One polishing operation could be eliminated in this way.

If you wish to polish the bulb before plating, then the article may be plated in a bright nickel solution, and the nickel coloring operation can be eliminated.

For a brightener to be used in the nickel solution we would suggest that you use one of the prepared brighteners that are on the market and which are advertised in THE METAL INDUSTRY.

O. J. S., Problem 5,017.

Brown on Bronze

Q.—We have been endeavoring to obtain a very light brown oxidation on commercial bronze about 90 and 10 mixture, without any particular success. Liver of sulphur and barium sulphide both show a reddish tint.

We would much prefer a cold dip of some type, as our experience with hot dips is that it is mighty hard to get them to run uniform.

A.—Different shades of brown may be produced on 90-10 mixture bronze from a number of solutions, the shade depending upon the proportions in which the solution is made, the temperature and the time of immersion.

Faster results and more even coloring will be gotten by flashing the parts in copper, preferably in acid copper, before oxidizing. A sample of the color desired would be helpful in advising as to the correct solution. One of the following formulae may be used:

1. Copper sulphate	24 ozs.
Nickel sulphate	3 ozs.
Potassium chlorate	6 ozs.
Water	1 gallon
2. Acetate copper	20 ozs.
Carbonate soda	20 ozs.
Aqua ammonia	20 ozs.
Water	1 gallon
3. Copper sulphate	4 ozs.
Potassium sulphate	1 oz.
Water	1 gallon

If shades are uneven in color the parts should be scratch-brushed either wet or dry, using a well worn brush for this purpose and re-immersed in the solution. Finished parts should be lacquered to prevent tarnishing. W. F., Problem 5,018.

Chromium for Printing Plates

Q.—I have inquiries for chromium plating on printing plates. I have done some samples, plating them the same as we do automobile work, but it is not satisfactory. They say it is not hard enough; this was on copper plates. They also have steel plates that they want plated if we can do them satisfactorily.

I wish you would let me know what is the usual process in chromium plating printing plates, both copper and steel.

A.—For chromium plating printing plates or other work where a hard deposit of chromium is desired the following formula is used:

Chromic acid	33 ozs.
Sulfuric acid	0.30 oz. by weight
Water	1 gallon

A temperature of 113° F. is used with a cathode current density of 150 amperes per sq. ft.

The usual alkaline cleaning methods are used with an acid dip before chromium plating with no intermediate deposit of nickel.

A frame type of rack can be used or a wire may be soft-soldered on the back of the plate and the edges shielded to prevent burning. A deposit of 30 to 60 minutes is usually of sufficient thickness.

O. J. S., Problem 5,019.

Fastening Aluminum Letters

Q.—Along with our work we manufacture grave markers and name plates. These pattern plates are made of aluminum and the letters for them are also made of aluminum. Please let us know the best way to fasten these letters to the plate for casting so that they may be easily removed.

A.—The best way to fasten aluminum letters on aluminum plates so that they can be easily removed is to shellac them on with good pattern makers' shellac. W. J. R., Problem 5,020.

Faulty Nickel Solutions

Q.—We are sending you by express prepaid three samples of nickel solution, marked 1, 2, and 3. We are also sending a sample top and bottom of a Flat Iron.

Solution No. 1 was made up some months ago in accordance with the following formula, which we received from you at that time:

Double nickel salts	8 ozs.
Single nickel salts	8 ozs.
Boric acid	3 ozs.
Sodium chloride	3 ozs.
Water	1 gallon

pH. 5.8 to 6. Operate solution at 110° F. and current density of 15 to 20 amperes per sq. ft.

In this solution, which is used in a still tank, we plated the sample bottom, which we are sending. This solution has been working very well until the last few weeks. We now find that we are troubled with pitting and also with bubbles sticking to the work. It is, therefore, necessary to agitate the work now and then to free it from the bubbles. We have also been compelled to add a small amount of peroxide. We also find that the work is coming out somewhat hard and it is difficult to buff it.

Solution No. 2 is a solution which we had made up for some time and which we tried to make conform to the formula of No. 1 by adding more or less ingredients. We have a tester for our plating solutions and after solution No. 1 was made up, it tested O.K., and we, therefore, tried to make No. 2 act in the same way and they both seem to test all right but do not perform properly. We find that solution No. 2 is turning out a hard nickel and it is practically impossible to buff the tops which are plated in this solution. It is also necessary to add as much as one gallon of peroxide per day, which to us seems excessive. What is necessary to add to these solutions in order to produce a softer nickel and put them in proper working order providing that they do not test correctly?

The sample solution No. 3 is a solution which we have had here for some time and we are not certain whether it will pay to dope it up or to throw it away. We would like to have your comments after testing same.

Our No. 3 and No. 2 solutions are used in moving tanks of 900 gals. All parts are chrome plated after nickeling.

A.—Analysis of nickel solutions:

No. 1 Still

Metallic nickel	3.06 ozs.
Chlorides	3.02 ozs.
pH	5.8

No. 2 Moving

Metallic nickel	2.25 ozs.
Chlorides	2.40 ozs.
pH	5.4

No. 3 Moving

Metallic nickel	3.04 ozs.
Chlorides	2.27 ozs.
pH	5.4

The metal and chloride contents of No. 1 tank are satisfactory. Would suggest that the pH be raised to 6 by adding 4 fluid ozs. of 26° ammonia to each 100 gallons of solution. If pitting continues it will be necessary to add sufficient hydrogen peroxide (100 volume) to stop the pitting. A much smaller quantity will be needed to produce results, and it will last longer. Mechanical agitation of the cathode is also recommended.

All constituents of No. 2 solution are too low. To the 900 gallons of solution add 225 lbs. of single nickel salts, 34 lbs. of sodium chloride and 75 fluid ozs. of 26° ammonia.

To correct No. 3 solution add 42 lbs. of sodium chloride and 68 fluid ozs. of 26° ammonia.

It will be necessary to use peroxide in No. 2 and No. 3 solutions if pitting is noted. It may be necessary to add it even if pitting is not present, to produce a soft nickel deposit which should buff very easily. O. J. S., Problem 5,021.

Ornamental White Bronze

Q.—Can you give us any information regarding the proper mixture and method of melting for making white bronze castings for ornamental work such as bank fixture work.

A.—The mixtures of white bronze, such as bank fixtures are either Monel metal or German silver (mostly Monel metal which is composed of approximately 68% nickel, 28% copper, 2% iron, balance, small amount of manganese and silicon). This metal can be purchased on the market already alloyed from any of the nickel companies. The German silver (or nickel silver) is approximately 18 to 20% nickel, 18 to 29% zinc, copper balance, and is easily alloyed. Nickel is charged into the crucible and when blood-red, add the copper a little at a time. When copper and nickel are melted, add the zinc. Stir well, and for fine work pour into ingots and remelt for casting.

Monel metal requires a good furnace to melt it. We recommend No. 70 crucibles, oil-fired furnace for this work. To get good results, furnace should be capable of obtaining 3,000 deg. F. The molding is best done in dry sand molds with proper gates and risers to suit the work. Germany silver can be cast in green sand, and to obtain best results, add about 0.25% aluminium to the metal and arrange the gates so that the metal will not dross.

W. J. R., Problem 5,022.

Silicon Copper

Q.—Will you kindly inform us how silicon copper is prepared and in what form the silicon is added to the copper? Is the pure silicon metal in powder form or alloyed with some other substance?

A.—Silicon copper is made by melting metallic refined silicon and copper together as an alloy of 10 per cent silicon and 90 per cent copper. It is poured in ingots and used as required for silicon content. W. J. R., Problem 5,023.

Small Brass Foundry

Q.—We are at present examining the economic possibilities of a proposal to establish a small foundry for the filling of our bronze requirements. The total amount of such needs that we would care to manufacture ourselves is relatively small, being about 2,000 pounds annually. This amount would be required in small quantities at a time.

We would like to hear from you regarding the equipment necessary to set up a unit to handle this work and also what in your opinion would be the minimum amount of work necessary to make the installation economical. Our present pattern shop would continue to take care of the pattern work. While elaborate equipment would doubtless be unnecessary, yet a certain amount of both equipment and organization would, we believe, be required in order to produce decent castings.

We would like very much to have a frank expression of your opinion on the feasibility of this proposal and if you consider it practical and what equipment, etc., would be necessary.

A.—In reference to the equipment necessary to set up a unit to cast brass, we would refer you to an article The Model Brass Foundry in THE METAL INDUSTRY, November, 1908, which we believe would suit your requirements.

However, it would seem to us that 2,000 pounds per year would hardly pay you. It would be necessary to hire at least one molder for 2,000 pounds per year or approximately 170 pounds per month, and this (counting 25 days per month) would be 7 pounds per day. If you pay your molder $7.00 per day, your castings would cost you $1.00 per pound for molding labor alone.

We would say you should have at the least 2,000 pounds per month to operate a small brass foundry unit. We do not know of any brass foundry operating on a production such as you require. Having your castings made in some jobbing foundry, should not run you over $.40 per pound, including the metal cost.

W. J. R., Problem 5,024.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,802,946. April 28, 1931. **Casting Magnesium and Alloys Thereof.** John E. Hoy, Midland, Mich., assignor to The Dow Chemical Co., Midland, Mich.

A method of inhibiting burning of a readily oxidizable light metal in casting, which comprises incorporating in a sand mold part of an oxidation-inhibitor agent selected from the group consisting of sulphuric acid and sulphates, sulphites, and halides of alkali and alkaline earth metals, whereby such agent is in surface exposure and is adapted to prevent burning of cast metal.

1,803,691. May 5, 1931. **Process and Apparatus for Plating Wire.** Carl P. Brockway, Ridgewood, N. J., assignor to World Bestos Corporation, Paterson, N. J.

The process of chromium plating an iron wire which comprises thoroughly cleansing said wire, passing said wire through a bath of the plating solution, and simultaneously causing a current to flow from said wire through said solution to an electrode, immediately thereafter causing a current to flow from another electrode through said solution to said wire whereby a coating of chromium is applied to said wire.

1,803,809. May 5, 1931. **Method of Producing and Refining Alloys.** Harry F. Porter, Trenton, N. J. Original application filed Jan. 20, 1927, Serial No. 162,245.

The method of simultaneously producing and refining a copper-nickel-iron alloy which comprises melting by induced electric currents a predetermined amount of copper having relatively high oxygen content, melting and dissolving a predetermined amount of nickel and commercial iron in said melt, effecting reduction of carbon in said iron by the oxygen content of the copper, and effecting a stirring motion of said solution to insure uniformity thereof by said induced currents.

1,804,101. May 5, 1931. **Apparatus for Electrolytically Producing Metal Alloys.** Ernst Kelsen, Vienna, Austria.

An apparatus for electrolytically producing metal alloys, which apparatus comprises a rotary cathode, a plurality of tanks containing different electrolytic baths, which tanks are arranged around the cathode in such manner, that the cathode will be successively put into contact with each of the said different baths.

1,804,484. May 12, 1931. **Bottle-Silvering Machine.** Miner P. Wetmore, Norwich, Conn., assignor to The American Thermos Bottle Company, Norwich, Conn., a Corporation of Ohio.

In a machine of the class described, a movable carrier comprising spaced rollers for supporting cylindrical bodies, means for mounting said rollers to rotate about their axes, and rotary means engaging said rollers at the bottom to rotate the same independently of the forward movement of said carrier, whereby the cylindrical bodies supported on said rollers are rotated without being engaged by said rotating means.

1,804,551. May 12, 1931. **Recovery of Tin Compounds.** Gibson Buttfield, Rockview Heights, North Plainfield, N. J., assignor to The Vulcan Detinning Company, Sewaren, N. J.

The process of recovering a tin compound from a tin-bearing acid liquor from which a tin compound is precipitated upon neutralization, which consists in continuously adding to a flowing stream of said liquor an alkaline agent in amount proportional to the degree of acidity and the volume of flowing liquor, collecting the resulting tin bearing precipitate by sedimentation and removing the supernatant liquor by decantation.

1,804,991. May 12, 1931. **Process and Apparatus for Coating.** Gustave A. Johnson, Irvington, N. J., assignor to American Steel Pipe Co., Inc., Irvington, N. J.

The method of coating pipes with aluminum which comprises dipping the pipes vertically in a tank containing a bath of aluminum powder and a liquid vehicle, which bath is circulated upwardly with a whirling motion from below the pipes so as to enter the interior of the pipes and to evenly flow over the exterior of the pipes.

1,804,883. May 12, 1931. **Alloy Metal for Bearings.** Walter Mathesius and Martin W. Neufeld, Berlin-Charlottenburg, Germany.

A bearing metal consisting of lead hardened by alkali metals and metals of the alkaline earths, containing 0.60-0.65 per cent. Na; 0.75-1. per cent. Ca; 0.20-0.25 per cent. Mg; 0.10 per cent. Al, the Pb constituting the main bulk of the alloy.

1,805,448. May 12, 1931. **Corrosion-Resistant Aluminum Alloy Article.** Francis C. Frary, Oakmont, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

A corrosion-resistant article of aluminous metal comprising a main body or core of aluminum-copper alloy and a hard, wrought, protective coating of copper-free aluminum alloy cohesively united with the core.

1,804,899. May 12, 1931. **Composite Metal.** Hermann von Forster, Niederursel, near Frankfort-on-the-Main, and Emil Lay, Eschersheim, near Frankfort-on-the-Main, Germany, assignors to Metallgesellschaft Aktiengesellschaft, Frankfort-on-the-Main, Germany.

A composite metal produced by welding a coating of copper-zinc alloy onto an iron core by the casting-on process, characterized in that the copper-zinc alloy contains over 60 per cent of copper and less than 0.01 per cent of lead.

1,805,920. May 19, 1931. **Making Copper Plated Shingles.** Fred Muschler, Denville, N. J.

A process for producing an adherent metallic coating upon an electrically non-conductive fibrous material which comprises coating the fibrous material first with a binder carrying a finely divided non-metallic conductor, and then with a binder having a finely divided conductor mixed therewith, immersing the coated article in a solution having a tendency to deposit metal by internal chemico-electrical reaction and causing the electrical current to flow between the conductor in the coating and the solution in such a manner as to assist the deposition of the metal as heretofore stated.

1,805,982. May 19, 1931. **Method of and Material for Preventing Metal from Corroding.** James H. Gravell, Elkins Park, Pa., assignor to American Chemical Paint Company, Ambler, Pa., a Corporation of Delaware.

A material for preventing metal from corroding being an admixture of a material adapted to liberate phosphoric acid upon the application of heat and a neutralizer for phosphoric acid.

1,806,414. May 19, 1931. **Processes of Polishing Chromium.** James Clarence Patten, Indianapolis, Ind., assignor to Metals Protection Corporation, Indianapolis, Ind.

The process of producing lustre on surfaces of chromium which comprises polishing such surfaces with a fine grained product comprising calcined hydrated alumina, the said product having a hardness materially less than that of emery.

1,806,805. May 26, 1931. **Apparatus for Treating Metal Sheets.** Edwin R. Knapp, Summit, N. J., assignor to Copper Plate Sheet & Tube Company, a Corporation of New Jersey.

A conveyor for carrying metal sheets in arched form, comprising two conveyor sections, each provided with arms extending toward the other section, gripping means at the free end of each arm for engaging an edge of an arched sheet, a track support for each conveyor section, and means for adjusting the positions of the track supports.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Chromium Plating Machine

Production costs in chrome plating screws and bolts of all descriptions can be greatly reduced by use of the new Automatic Chrome Plating Machine recently developed by the Sturt Engineering Corporation, 7001 N. Clark Street, Chicago, according to the statement of that company.

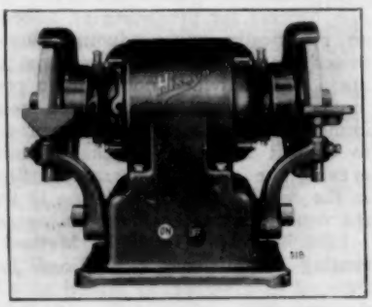
The machine is a self-contained unit to which screws or bolts are automatically and continuously fed by means of a specially designed feed hopper. They are then carried through the solution by means of a specially designed conveyor, mechanically dumped into a neatly designed washer and dryer and discharged into a waiting receptacle. The only manual operations involved are the dumping of the screws into the feed hopper and taking them away at the dryer end.

The machine is designed to handle screws as small as No. 6 size up to 5/16" x 2", and in the larger sizes will handle up to 100,000 screws per 8½-hour day, with correspondingly larger production on smaller sizes. One operator can easily handle two of these machines and the job is made easy for him, since he at no time comes into direct contact with the chromic acid, nor is he subjected to the fumes.

Sturt Engineering Corporation has also developed an automatic buffing machine for screw and bolt heads, which, it is said, is a labor saver to those who prefer buffing of screws to ball burnishing.

An Improved Motor

The illustration shows a Hisey 6 and 7-inch wheel grinder which is now equipped with an improved commutating type repulsion induction motor, to comply with the more stringent electric codes now in effect in many localities. It is made by the Hisey-Wolf Machine Company, Cincinnati, Ohio. The starting current under all conditions is unusually low, being less than one-third the current consumption of a grinder equipped with a split phase motor.



New Grinder Motor

Low voltage so often encountered, due to line drop and other existing conditions—which cannot always be overcome — is the cause of much trouble with grinders equipped with split phase motors, but this low voltage factor is said to have no objectionable effect on this Hisey grinder. Unlike the split phase motor, this improved motor has no dragging centrifugal switch and will start and pick up speed instantly.

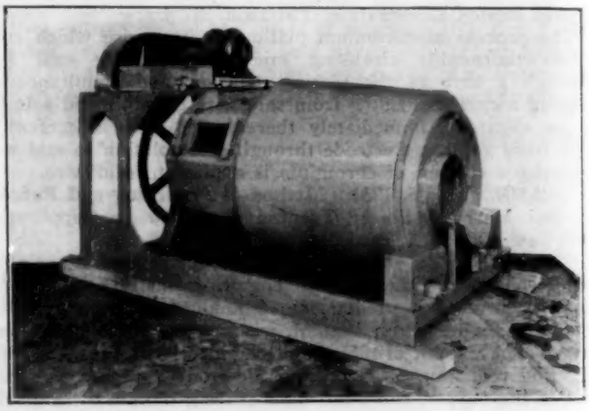
New Sun-Proof Lacquer

A new lacquer for outdoor use, whose chief attribute is said by the manufacturer to be proof against the actinic rays in sunlight, has been placed on the market by The Egyptian Lacquer Manufacturing Company, Inc., 90 West Street, New York City (branches in principal cities throughout the United States.) The new product is known as "Actino." It is stated to be a clear lacquer, capable of remaining unclouded and constantly protective to metals while in direct daily sunlight. Development of the material is said to have required several years of research. Uses for it include such applications as on metal store fronts, lamps, signs, doors, and other metallic surfaces in outdoor service which need protection from the action of the sun, which has adverse effects on bright metals constantly exposed. Samples and full information are available from the company to interested manufacturers.

New Burnishing Barrel

Extensive working tests made at the American Safety Razor Corporation's Brooklyn plant are said to have proven the increased efficiency of a new type of burnishing barrel. The increased efficiency of the machine is especially evident where the volume of production is large and the required burnishing period comparatively short.

The new type of barrel loads in the same way as the standard



New Ransohoff Burnisher

burnishing barrel, through a door in the periphery. The burnishing operation is the same as the standard type barrel in which the diameter is greater than the length. When the burnishing is completed, the barrel is rotated in the opposite direction by means of a reversing switch on the motor. This automatically discharges the work through the screen in the center of the barrel, the work coming out at the end, the balls passing through the perforations in the screen and being retained in the cone surrounding the screen.

As soon as the work is discharged, the barrel is ready for another load. When the work is loaded and the door in the periphery bolted shut, running the barrel again in the burnishing direction causes the balls to return to the burnishing compartment automatically.

All work of rehandling the balls is eliminated. This saving in time in discharging and recharging is an important factor. The fact that the barrel discharges at the end enables it to be built close to the ground. This permits a larger diameter of the tumbling compartment without excessive loading height.

Production officials report that the new barrel has a capacity 2½ times that of the old style barrels and with a one-hour burnishing period it will handle eight loads in nine hours as against six loads in the case of the old type of barrel, making the new equipment equal in performance to 3.3 old barrels. It takes five minutes to discharge and reload the new barrel, one-sixth the time required with the former equipment.

The quality of the finished work has also been improved, due doubtless to the greater burnishing pressure in the new barrel because of its greater diameter. The new barrel was designed and built by N. Ransohoff, Inc., Cincinnati, Ohio, who have as a result of these tests added it to their regular line of burnishing, plating and metal cleaning equipment.

Chromium Plating Tank Rheostats

Tapered Resistance for Variable Voltage Control

By M. M. ROSE

Columbia Electric Manufacturing Company, Cleveland, Ohio

The standard plating tank rheostat in general use for electroplating of copper, nickel, etc., is usually designed for a single voltage drop, say 3, 4 or 5 volts. All resistors are based on the same voltage drop with rated current flowing.

A typical 1,500 ampere rheostat designed for 3 volt drop has 12 contacts with a minimum ampere step of 25 amperes, giving 60 steps of control in 25 ampere divisions throughout the entire range, up to 1,500 amperes with all contacts engaged. Each division is designed for 3 volts drop.

This type of rheostat is fairly well suited for such types of plating as copper, nickel, etc., where a fixed voltage such as 1 or 2 or 3 volts is required on the tank, and where the ampere capacity required depends upon the amount of work in the tank. As a general rule, therefore, regardless of the amount of work in the tank and the amount of current required, it is desired to keep the voltage across the anode and cathode approximately constant, and the foregoing type of rheostat gives entire satisfaction.

For chromium plating, however, the voltage required may vary with the size, shape and character of the work. Some classes of work are plated at as low as 3 volts, while others need 6 volts and even higher.

When one generator is serving a number of tanks, and these tanks are required for various classes of work, such, for example, as copper, nickel and chromium, it is not practical to connect the chromium tanks directly to the generator buses and to obtain the voltage required on the chromium tanks by means of field control of the generator. When this is attempted, the voltage on the other tanks is also changed, causing poor plating results. Therefore, the logical way to obtain a variable voltage on the chromium tank is to leave the generator voltage fixed and to place a special rheostat in the branch circuit to the chromium tanks, it being understood, of course, that the other tanks—copper, nickel, etc.—are likewise provided with a rheostat in their respective circuits.

For chromium plating, if we assume a bus voltage of 6, the rheostat for the chromium tanks should be designed so that at low values of current, a 3 or 3½ volt drop can be secured. As the current is increased, the voltage drop is decreased so that with a heavy current flowing, a voltage drop of 1 volt is obtained, corresponding to 5 volts on the tank.

A typical tapered resistor type rheostat, capacity 1,500 amperes, voltage drop from 3½ to 1 volt, is made up according to the following layout.

An inspection of the table below will indicate that with all 12 contacts engaged, a total rating of 1,509 amperes is secured at 1 volt drop. The ampere rating, with corresponding voltage drop, is indicated for each individual contactor. Furthermore, various combinations of voltage may be secured, so that for 1½ volt drop with contactors 1, 2, 3, 4, 5, 6, 7 and 8 engaged, the total current would be 1,063.5; at 2 volts drop, 458,5 amperes, using contactors 1, 2, 3 and 4; at 2½ volts drop, 323 amperes, using contactors 1, 2 and 3; at 3 volts drop, 137 amperes, using contactors 1 and 2; at 3½ volts drop, 25 amperes, using contactor 1.

By using additional steps of resistance, increased ampere capacities may be obtained for the lower values of tank voltage, corresponding to greater voltage drop in the rheostat. A range of from 1 to 5 volts drop is readily secured with any desired combination of ampere capacities.

A New Low Melting Point Brazing Alloy

Handy & Harman of 57 William Street, New York, producers of sterling silver sheet metal and wire, silver solders and silver alloys in general, have applied for a patent on a new brazing alloy which they call "Sil-Fos." It contains a small percentage of silver and is described as flowing freely at 1,300° F.

Sil-Fos promises to be worthy of consideration where higher melting point base-metal brazing or welding alloys cannot be used without danger of weakening, distorting or destroying the parts adjacent to the joint. When it is remembered that the commercial silver solders containing 50% silver, or less, require 1,400° to 1,600° F. to melt and the base-metal brazing alloys from 1,600° to 2,100° F., part of the importance of this development can be realized.

Sil-Fos is described as also possessing free flowing properties, with deep and quick penetration. This characteristic is doubtless due to the silver in the alloy. In addition, it is pointed out that at 1,400° F., the flow point of borax flux with which it is generally applied, there is 100° of superheat which increases the fluidity still further and aids penetration and alloying action.

Another interesting feature claimed for Sil-Fos is that it requires less than the usual amount of flux because of the deoxidizing effect of the phosphorus in the alloy. This would seem to be an important advantage and should tend to reduce the cost of cleaning and finishing after joints have been made. Under certain conditions, satisfactory copper to copper joints can be made without using any flux.

As to strength, the makers report, for example, that lap joints of copper sheets show tensile strength of approximately 30,000 pounds per square inch. They also state that Sil-Fos can be used in many cases for joining brass, bronze, nickel, nickel-silver, extruded brass and bronze, Monel metal, and other metals and alloys fusing above 1,300° F.

While containing silver, Sil-Fos is not classed as a silver solder by its makers. It is sold by the avoirdupois pound rather than by the troy ounce, as are silver solders usually. The prices quoted range from $3.00 a pound, for thin strip in small quantities, down to $1.25 a pound for rods in large lots. These prices, combined with the small quantity of Sil-Fos necessary for tight-fitting joints, and the speed with which the brazing is done, usually make Sil-Fos brazing economical, they say.

Table of Rheostat Ratings

Step	Amps.	Volts Drop	Amps. at 1 V. drop	Amps. at 1½ V. drop	Amps. at 2 V. drop	Amps. at 2½ V. drop	Amps. at 3 V. drop
1	29	3½	8½	12.5	16.5	21	25
2	112½	3	37½	56.0	75.0	94	112½
3	208	2½	83	125.0	167	208	137.5
4	200	2	100	150.0	200	323	
5	180	1½	120	180	458.5		
6	180	1½	120	180			
7	180	1½	120	180			
8	180	1½	120	180			
9	200	1	200	1063.5			
10	200	1	200				
11	200	1	200				
12	200	1	200				
			1509				

Zinc Coated Sheets to Show Quality

A "Seal of Quality," to be stenciled on galvanized sheets carrying specified weights of zinc coating, has been adopted by the American Zinc Institute, Inc., New York, and is shown by the illustration. This seal will be used by manufacturers of galvanized sheets under a license arrangement, to indicate sheets of certified quality.

Extensive studies by the Zinc Institute and various technical organizations have shown that the dominant factor in determining the service of a galvanized sheet, from the standpoint of continued freedom from rust, is the thickness or weight of the zinc coating. This is customarily expressed in ounces per square foot, meaning thereby the total amount of zinc on both sides of the sheet; for instance, a 2-ounce coating means approximately one ounce per square foot on each side. A heavier zinc coating will naturally give longer life; in fact, a relatively small increase in the coating will result in a very substantial increase in life and service.

These facts have been well established, but curiously enough they have not been explained in any way to a large section of the consuming trade. A great deal has been said about the nature

of the base metal used for galvanized sheets, which may be Bessemer or open hearth steel, copper-bearing steel, pure iron, copper iron, wrought iron, etc.; and the relative rates of corrosion (or rusting) of these materials when exposed in an uncoated state have been fairly well brought out by numerous tests. A galvanized sheet, however, is a sheet of one of these materials coated with zinc to protect it from rust, and the degree of this protection is dependent primarily upon the weight of the zinc coating.

A sheet of any one of the various base materials, if insufficiently coated, will begin to rust and turn brown in a short time, the difference between the various materials being that the more "rust-resistant" will then last longer before the sheet rusts clear through. Regardless of what material is used, however, if it is desired to secure freedom from rust and the consequent need of painting over a long period of time, it is essential to use sheets carrying a sufficiently heavy coating of zinc.

Because of the variation in the zinc coatings on commercial galvanized sheets today, and the lack of any means whereby the consumer may identify an adequately coated product, the "Zinc Institute Seal of Quality" has been suggested by both producing and consuming interests. Sheets bearing this seal will carry weights of zinc coating which were decided upon after careful field studies as being most suitable for the service desired.

For use in rural communities, particularly for roofing and siding of farm buildings, such sheets will be produced in No. 28 and No. 26 gauge, with a coating of 1.75 ounces of zinc per square foot. This coating is fully 40 to 100 per cent heavier than coatings on most of the commercial sheets produced today, and will preserve the sheets from rust for a far longer period than the thinner coatings. For use in localities where atmospheric conditions are more severe, sheets of 26 gauge and heavier, carrying 2.00 to 2.50 ounces of zinc per square foot, will be produced.

These heavily coated sheets will be sold mainly in the corrugated and V-crimp types, for use in roofing, siding and similar applications. Such sheets should not be subjected to severe bending or extreme forming operations unless special measures are taken to prevent damage to the coating.

Application has been filed by the Zinc Institute with the U. S. Patent Office for registration of the seal, and its use will be limited to sheets produced under license, subject to careful checking as to the standard of zinc coating. The matter has been submitted to all of the manufacturers of galvanized sheets and the right to use the Institute's trade-mark is available to each of them without charge. License arrangements are now being concluded with a number of the manufacturers.

Every sheet produced under this arrangement will be stenciled with the "Seal of Quality" and the weight of zinc coating, and also with the manufacturer's own name or trade-mark. The seal is thus a stamp of approval, similar to the underwriters' label on electrical apparatus, affording a means of identifying a quality product.

As a further means of assisting those interested in galvanized materials, the Zinc Institute has begun a program of educational work, designed to inform both consumers and dealers as to the differences in zinc coatings and means of obtaining products which will give superior service. In this work, particular attention will be devoted to the rural field, in which galvanized products are widely used and in which there is practically no understanding of the factors which constitute quality.

Copper Plating Stainless Steel

Crown Rheostat and Supply Company, 1910 Maypole Avenue, Chicago, Ill., announces a process for copper plating stainless steel. Working in conjunction with the Etching Company of America, a commercial method has been developed for electrodepositing copper on nickel—chromium—iron alloys. It is impossible at this early date to estimate the great possibilities of this process, the company says. It is apparent, however, that such a process can at present be used to advantage in etching and lithographic work.

Hydrogen Sulfide Generator

Schools, colleges and industrial plants using hydrogen sulfide will find, it is claimed, in a new hydrogen sulfide generator, many advantages over other types. It is easy to fill and clean and does not clog. There can be no back pressure of gas to cause the hydrogen sulfide to escape into the room, with attendant dangerous, disagreeable and ill effects. It occupies only small space, is practically indestructible, and the cost is low.

Generators which feed the acid onto the ferrous sulfide at the top of column, stop generating hydrogen sulfide as soon as the fine ferrous sulfide and insoluble material are carried to the bottom of the column and form a caked mass, as that stops the flow of acid over the ferrous sulfide. This hard cake must then be removed before the generator will again operate.

This generator is made of acid-proof chemical stoneware, vitrified all the way through. It does not depend on an applied glaze or veneer for its acid-resisting properties. It is guaranteed to be tight, non-porous and impenetrable by the acids used. It is made by the General Ceramics Company, New York City.

A New Hydrogen Sulfide Generator

Improvements in Power Presses

New improvements in the design of the power presses built by the Farrel-Birmingham Company, Inc., of Ansonia, Conn., are said to afford greater safety in operation and increase production at less operating and maintenance cost.

The new design now incorporates anti-friction bearings as standard equipment for the drive shaft of all geared presses. Wherever conditions permit, a bearing of the anti-friction type is placed on each side of the main pinions in order to provide more uniform bearing of the pinion teeth on those of the gear as well as to reduce the friction in the shaft bearings themselves. With this construction, considerably less power is required for operating the presses, thus reducing the power cost to a minimum.

Another feature in the latest design of these presses is a multiple disc friction clutch with magnetic control and magnetic brake. The presses equipped with magnetic clutch and brake have push button control with start and stop buttons for one or more operators and at any point or as many points about the press as may be necessary or desired.

A selector switch and inching control enable the operator to run the press either continuously, a stroke at a time, or to inch the press under perfect control for special working conditions or for setting dies.

A positive stop on the up stroke makes repeating impossible except when continuous operation is selected by the operator pushing the proper button. Stop buttons will stop the press instantly at any point of the stroke under any of the selected operations. These stop buttons may be located at as many places about the press as may be desired, a safety feature in press operation never before provided.

A rheostat may be used in series with the magnet to control the clutch to a given horsepower. This feature is direct protection against breakage of press parts due to overloading of the press and provides additional safety for the operator.

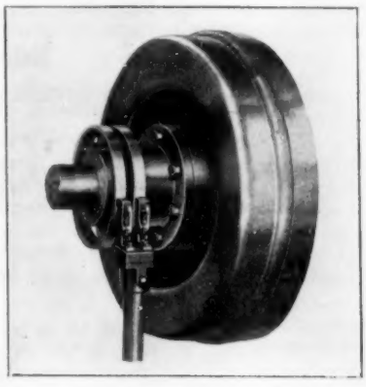
Much less exertion, of course, is also required for push button control than is required for operating a mechanical clutch. Fatigue of the operator, therefore, is reduced and is a factor in continuous operation and increased production.

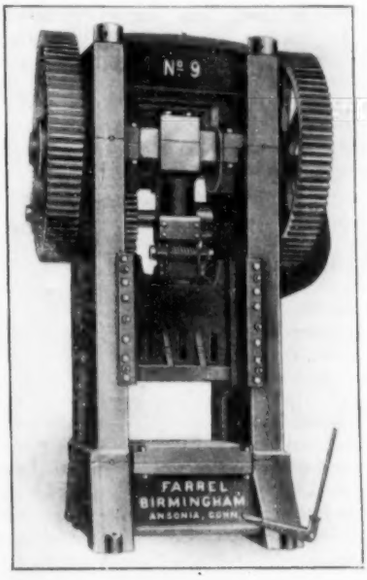
Briefly, the magnetic clutch and brake on a power press result in (1) greater safety and less exhaustive work for the operator; (2) prevention of breakage due to control of loading of the press and prevention of overloading; (3) increased production due to more continuous operation, and (4) reduced operating and maintenance cost.

New equipment has been added to an enlarged welding department at the Farrel-Birmingham plant for the building of power presses of all-steel frame constructions and for the building of other special machinery to which the welding process is applicable.

Right — 9-Inch Shaft, Single Crank Press.

Below—Magnetic Multiple Disc Clutch





A large variety of equipment is being fabricated in this department under the direct supervision of engineers thoroughly conversant with this form of construction. Welded steel construction permits the building of presses and other machines in a minimum of time, making quicker delivery possible and eliminating the cost for new patterns or the alteration of old ones.

Equipment and Supply Catalogs

Potentiometer Pyrometer. The Brown Instrument Company, Philadelphia. Folder.

Welding Rod and Equipment. Joseph T. Ryerson and Son, Inc., Chicago, Ill. Illustrated pamphlet.

Synchronous Motors. The Ideal Electric and Manufacturing Company, Mansfield, Ohio. 20-page illustrated bulletin.

Hobs, Milling Cutters and Reamers. Barber-Colman Company, Rockford, Ill. Combined handbook and catalog.

Precision Roll Grinding. Farrel-Birmingham Company, Ansonia, Conn. Booklet, illustrated.

Switchgear. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Illustrated booklet.

Chemical Price List. Roessler and Hasslacher Chemical Company, 350 Fifth Avenue, New York. Quarterly list of prices.

Waterproof Sealing Compound. Quigley Company, 56 West 45th Street, New York. Leaflet on "Hydro-Seal" for water, gas and air line joints.

Annealing Furnace. W. S. Rockwell Company, 50 Church Street, New York. Bulletin on "Continuous Clean Annealing Furnace, conveyor type."

Hellige Comparators, for use in acidity tests and nickel determinations in nickel plating solutions. Has permanent, accurate, glass color standards.

Steam Trap. C. J. Tagliabue Manufacturing Company, Park and Nostrand Avenues, Brooklyn, N. Y. Circular on a new thermostatic steam trap.

Combustion Steam Generator. Combustion Engineering Corporation, New York. Catalog SG-1, fully describing a complete steam generation unit. Very fully illustrated.

Aluminum. The London Aluminum Company, Ltd., Witton, Birmingham, England. "What We Can Do," a 32-page illustrated booklet on applications of aluminum and its alloys.

Monel Metal Seamless Buckets. The Weaver Brothers Company, 9315 Sandusky Avenue, Cleveland, Ohio. Leaflet on noncorrosive buckets and other Monel products.

Dynamos. Charles J. Bogue Electric Company, Hoboken, N. J. Bulletin 12 on equipment for electroplating, electrotyping and general electrolytic work. Fully illustrated.

Facts for Foundrymen. Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y. Bound booklet by E. G. Jarvis and Samuel Frankel, relating to use of specially prepared alloys, etc. This is the second edition.

Catalog List. The Baird Machinery Company, Bridgeport, Conn. A circular listing the company's various catalogs of wire and ribbon metal forming and other automatic machinery; presses, lathes, tumbling and burnishing equipment, etc.

General Electric Company, Schenectady, N. Y., publications: Industrial Heating Devices; Soldering Iron; Controllers; Catalog of Motion Pictures and Illustrated Lectures; Built-in Speed Reducers; Solenoid-operated Valves; Pole-changing Switches; Combination Magnetic Switch; Adjustable Speed d.c. Motors; Centrifugal Air Compressors; Turbine-Generator Sets; BTA Motors; Explosion-proof Totally Enclosed, Fan-cooled Induction Motors; Vertical Induction Motors; Direct-current Motors; Turbines; Motor Brakes; Price List of Plastic Products; Capacitors; Electric Equipment for Foundries, 52 pages, illustrated.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

HEADQUARTERS, CARE OF H. A. GILBERTSON, 434 WABASH AVENUE, CHICAGO, ILL.

Research Fund Treasurer's Report

Philip Sievering, secretary-treasurer of the Research Fund of the American Electroplaters' Society, has issued the following report for the period of June 1, 1930, to May 31, 1931:

Subscriptions

Carry McFall Company	$ 50.00
Felt and Tarrant Company	150.00
Rochester Branch	9.00
McDermid, Inc.	25.00
Guide Lamp Corporation	50.00
Baltimore-Washington Branch	100.00
Grauer and Weil	25.00
Chicago Branch	150.00
Philadelphia Branch	150.00
International Nickel Company	50.00
Sargent and Company	50.00
Newark Branch	50.00
Toledo Branch	50.00
Milwaukee Branch	50.00
Los Angeles	50.00
Hartford-Conn. Valley Branch	50.00
Western Clock Company	150.00
Bell Laboratories	50.00
Dayton Branch	25.00
Total	$1,284.00

Total Receipts

Subscriptions	$1,284.00	
Interest on Deposits	35.12	
W. P. Barrows Advanced Expense Account Returned	200.00	
Compensation Insurance Premium Returned	16.08	
		$1,535.20
Balance in Treasury June 1, 1930		2,969.13
		$4,504.33

Total Disbursements

Printing and Stationery	$ 52.00	
Treasurer's Bond Premium	12.50	
Compensation Insurance Premium	30.08	
Advance Expense Account	200.00	
Traveling Expenses	111.12	
Salaries to Associate Chemist	1,600.02	
		$2,005.72
Balance in Treasury June 1, 1931		$2,498.61

The Electrochemical Society

HEADQUARTERS, CARE OF DR. COLIN G. FINK, COLUMBIA UNIVERSITY, NEW YORK, CITY

Fall Convention at Salt Lake City

As previously announced, the Fall convention of The Electrochemical Society will take place at Salt Lake City, Utah, September 2 to 5, inclusive. Headquarters will be the Hotel Utah, where reservations may be made for rooms from $2.50 per day up.

M. R. Thompson of the Bureau of Standards is arranging a session on cyanides—cyanides in mining, cyanides in plating; the production of cyanides from calcium cyanamid, etc.

There will also be papers on Electric Furnaces and Electrodeposition, at a scientific-technical session to be presided over by Dr. Bradley Stoughton.

Numerous side trips, excursions, plant and mine visits, and social features are on the program. These will occur both during and after the convention.

International Testing Congress

HEADQUARTERS, CARE OF M. ROS, DIRECTEUR DU LABORATOIRE FEDERAL d'ESSAI DES MATERIAUX, ZURICH, SWITZERLAND

The first International Congress of the New International Association for Testing Materials will take place at Zurich, Switzerland, September 6 to 12, 1931. The object is to promote and facilitate international exchange of ideas in the field of material testing. The American member of the Permanent Committee is W. H. Fulweiler, care of American Society for Testing Materials, from whom complete information is available.

National Research Council

HEADQUARTERS, 29 WEST 39TH STREET, NEW YORK CITY

A tour of laboratories will be made this Fall by one hundred business men and executives under the auspices of the Division of Engineering and Industrial Research of the National Research Council to show how the nation's industries, small and large, are turning to scientific research to aid them in solving many major industrial problems in an era of rapid economic changes.

It is planned to have the tour start in New York City on Monday, October 5. Metallurgy will have a prominent place on the program. A number of executives of metallurgical industries are included in the party taking the tour.

Full particulars may be had by addressing the Council.

Non-Ferrous Ingot Institute

HEADQUARTERS, 308 WEST WASHINGTON STREET, CHICAGO, ILL.

Members of the Non-Ferrous Ingot Metal Institute held a meeting at Atlantic City on July 10 and are reported to have discussed the problem of getting purchasers of brass ingot to accept deliveries when these fall due. Some ingot makers are still carrying ingot on their books that was bought for fourth-quarter 1930 delivery. The practice of some consumers in not specifying against old purchases from one ingot maker and buying from another, when the price has dropped, is also understood to have been discussed.

Institute of Metals Division

HEADQUARTERS, 29 WEST 39TH STREET, NEW YORK

National Metal Congress and Exposition

The National Metal Congress and National Metal Exposition will be held this year on the Commonwealth Pier, Boston, Mass., September 21 to 25, inclusive. The Institute of Metals Division and a number of other technical societies take part in this annual event. It is announced that there will be over 40 technical sessions and over 200 exhibitors using 60,000 square feet of space. Many visits to the metal manufacturing plants of New England will be available.

Foundry Equipment Manufacturers

HEADQUARTERS, CLEVELAND, OHIO

New officers recently elected by the Foundry Equipment Manufacturers' Association are as follows: President, H. S. Simpson, National Engineering Company, Chicago, Ill.; vice-president, J. P. Jones, General Electric Company, Schenectady, N. Y.; board of directors includes the above and H. S. Hersey, C. O. Bartlett and Snow Company, Cleveland, Ohio; M. C. Sammons, Wadsworth Core Machine and Equipment Company, Akron, Ohio, and H. J. Koch, Fort Pitt Steel Castings Company, McKeesport, Pa.; secretary-treasurer, D. M. Avey, Penton Publishing Company, Cleveland, succeeding R. P. Dryer, who has resigned to give full time to the Steel Office Furniture Institute.

American Standards Association

HEADQUARTERS, 29 WEST THIRTY-NINTH STREET, NEW YORK CITY

The organization of the sectional committee on standardization of foundry equipment (B45) has just been completed under the procedure of the American Standards Association. E. S. Carman, president of Edwin S. Carman, Inc., Cleveland, Ohio, is chairman of the committee, and John J. Baum, development engineer, Steel Founders Society of America, New York City, is secretary.

The work of the committee has been divided between three sub-committees. The project is under the joint sponsorship of the American Foundrymen's Association and the American Society of Mechanical Engineers.

International Foundry Congress

HEADQUARTERS, MILAN, ITALY

An international foundry exhibition and congress will be held at Milan, Italy, September 12 to 27, under the auspices of the International Committee of the Foundry Technical Associations of Italy. All nations are invited to participate. The exhibition will be held in the Machinery Hall of the Milan Fair. Following items will be exhibited: raw materials, finished and semi-finished products, machinery and materials for foundries, tools, statistical tables, plastic materials. The address of the general executive committee in charge is Esposizione e Congresso Internazionali di Fonderia, Milano, Italy.

Personals

H. F. Seifert

H. F. Seifert was recently appointed superintendent of the brass foundry and copper mill of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Mr. Seifert has been further honored by the nomination for presidency of the Pittsburgh Foundrymen's Association.

Mr. Seifert has been a nonferrous metallurgist and foundryman throughout his professional career, which began upon his graduation from Columbia University in 1906 with the degree of Mining Engineer. For six years after his graduation he was associated with the Nichols Copper Company at Laurel Hill, N. Y. Following that he was for two years in charge of anode casting at the Baltimore, Md., plant of the American Smelting and Refining Company. Since 1916 he has been with Westinghouse, where, before the recent promotion, he was assistant superintendent of the brass foundry.

H. F. SEIFERT

The reclamation of nonferrous scrap has received a good deal of Mr. Seifert's attention. He has been very active in the American Foundrymen's Association as well as in the Pittsburgh group. He has long been a member of the national organization's Committee on Recommended Practices for Nonferrous Metals.

H. G. Chase is now sales manager of the Standard Alloy Company, Cleveland, Ohio. He was formerly identified with General Alloys Corporation, Boston.

Frederic M. Feiker, former director of the Associated Business Papers, has been appointed director of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

Louis Sandler, general works manager of the Johnson Bronze Company, New Castle, Pa., has been elected vice-president, effective immediately. Mr. Sandler will act as assistant to **P. J. Flaherty,** president.

Cornelius F. Kelley, president of the Anaconda Copper Mining Company, New York, sustained the loss of a number of art works as well as other furnishings when fire, believed to have been caused by lightning, broke out in his Fifth Avenue, New York, apartment July 22.

Edwin A. Carter has been elected to the newly created office of chairman of the board of directors, Chapman Valve Manufacturing Company. Mr. Carter is vice-president of the above company. **T. F. Mahar,** sales manager, has been chosen vice-president and general manager.

Vincent W. Allen has been appointed manufacturing manager of Revere Copper and Brass, Incorporated. He will be located at the general offices, Rome, N. Y. Mr. Allen formerly was works manager of the Michigan division, and before that was with the American Brass Company.

J. A. Doucett has been appointed vice-president and general sales manager of Revere Copper and Brass, Incorporated. He was formerly vice-president and assistant general sales manager, and before that was president of Michigan Copper and Brass Company, Detroit, Mich., now the Michigan division of Revere, and he was at one time associated with the American Brass Company in the Buffalo and Kenosha branches. His offices will now be at 230 Park Avenue, New York.

Lloyd C. Cooley has been appointed sales representative of The U. S. Stoneware Company, New York, for the Chicago, Ill., district, with offices at 75 East Wacker Drive. Mr. Cooley is a graduate in chemical engineering of Massachusetts Institute of Technology; he has had considerable chemical experience having formerly been with the E. B. Badger Company, the U. S. Industrial Chemical Company, and The Swenson Evaporator Company, in sales and engineering capacities.

George T. Wigmore, director, secretary and treasurer of the Bridgeport Brass Company, Bridgeport, Conn., has resigned because of ill health. Mr. Wigmore is secretary of the Risdon Manufacturing Company, Naugatuck, Conn., and will continue with that company. **Ernest S. McClary** was elected secretary-treasurer to succeed Mr. Wigmore. **Leonard M. Allen** was appointed assistant treasurer and **William R. Breetz** was named assistant secretary. **Selwyn Bywater,** New York, is on the board of directors.

Richard L. Binder, president of the Metals Coating Company of America, Philadelphia, Pa., sailed on the liner Europa on July 7 for a business trip to Europe. Mr. Binder plans to establish contact with important developments abroad and to gain first-hand knowledge of the opportunities afforded by Germany in view of the economic adjustment now under way. He will visit his company's plants in Hamburg and Berlin. He is accompanied by **Dr. Leopold Pessel,** chemist and metallurgist of the company.

J. C. Nicholls of Copper Cliff has been promoted from general manager to assistant to the president at Toronto, of The International Nickel Company of Canada, Limited. **Donald MacAskill** of Copper Cliff has been promoted from manager mining and smelting division to general manager. **Dr. John F. Thompson,** assistant to the president, was appointed vice-president. Both Dr. Thompson and Mr. MacAskill have been with the Company or the predecessor companies for a quarter of a century, while Mr. Nicholls joined the Company in 1913.

Obituaries

Dr. Edward G. Acheson

Dr. Edward Goodrich Acheson, noted scientist, discoverer of carborundum, oildag and other artificial graphite products, died in New York on July 6, 1931, after a week's illness with pneumonia. He was seventy-five years of age.

Dr. Acheson was born at Washington, Pa., and studied at Bellefont Academy until he was sixteen, when his father's business was ruined by the panic of 1873. He began as timekeeper at a Pittsburgh blast furnace. Later he became an assistant draughtsman under John Kruesi, a member of the Edison engineering staff at Menlo Park, N. J. Later he was with the Consolidated Lamp Company, Brooklyn, N. Y., and then the Underground Cable Company, Pittsburgh, Pa. He produced carborundum in the electric furnace in 1891 and not long after he succeeded in producing artificial graphite, both of which were achievements of revolutionary magnitude in industry and science, as well as for military purposes, where graphite is used to increase the range of big guns. Dr. Acheson created a trust fund of $25,000 in 1928, to form the basis of an award every two years of a gold medal and $1,000 for distinguished achievement in the branches of science fostered by The Electrochemical Society, which makes the awards. At the time of his death he was chairman of the board of the Acheson Graphite Corporation, New York, and of several other companies. Dr. Acheson is survived by his widow, four sons and three daughters.

John L. Agnew

John Lyons Agnew, vice-president of the International Nickel Company of Canada, Ltd., died at Copper Cliff, Ont., last month after an attack of heart failure induced by influenza. Mr. Lyons had been in charge of the company's Canadian as well as British operations. He was a director of the Canadian company and also of the International Nickel Company, Inc., which operates in the United States; he also was a director and deputy chairman of the Ontario Refining Company, Ltd., and a director of the Bank of Toronto.

Born at Pittsburgh, Pa., in 1884, Mr. Agnew studied mining and metallurgy and at 19 went to the Canadian Copper Company, Copper Cliff, where he worked in nearly every capacity in the smelting department and eventually becoming smelter superintendent, then general superintendent of the company. He became vice-president of the nickel company when it was formed through consolidation of a number of concerns including Canadian Copper. His career was marked by high executive ability.

Mr. Agnew is survived by his widow, two daughters and a son.

John S. Armour

John S. Armour, sales manager of the Campbell-Hausfeld Company, Harrison, Ohio, manufacturers of metal melting furnaces, died at Cincinnati, Ohio, July 6, 1931, after taking sick while on a business trip to Chicago. Mr. Armour was originally connected with the James H. Mathews Company, Pittsburgh, Pa. In 1918 he went to the Campbell-Hausfeld Company, for whom he managed the melting furnace sales, which he thoroughly developed in the nonferrous foundry field. He was widely acquainted in the industry and was a familiar figure at foundrymen's conventions, where he was always to be seen in charge of his company's exhibits. He is survived by his widow and three children.

George H. Niedlinger

George H. Niedlinger, retired president of the Peerless Tube Company, Bloomfield, N. J., makers of collapsible tubes, died July 8, 1931, at his home in East Orange, N. J. Mr. Niedlinger was 60 years old. He was born at Brooklyn, N. Y., and founded the Peerless company in 1905. He was active in civic as well as industrial affairs, was a field commissioner of the national Boy Scout organization and a founder of the Bloomfield Manufacturers' Association.

Mr. Niedlinger is survived by his widow and three children.

Albert N. Abbe

Albert N. Abbe, died of a cerebral hemorrhage at the New Britain General Hospital on May 29, aged 71 years. Mr. Abbe was vice-president and general purchasing agent of the American Hardware Corporation, New Britain. His early business training included bookkeeping for a plumbing house in New Britain, and in 1887 he was made purchasing agent of the P. & F. Corbin Company. In 1903 the Corbin company was merged into the American Hardware Corporation, and Mr. Abbe was appointed general purchasing agent.

J. Richard Francis

J. Richard Francis, 60 years old, president and general manager of the Marvel Carburetor Company, Flint, Mich., and vice-president of the Borg-Warner Company, Chicago, Ill., died recently at Miami, Fla. He came to Flint in 1912, when the Marvel organization was moved there from Indianapolis.

F. J. H.

Charles Miller Robertson

Charles Miller Robertson, president of James Robertson and Company, Ltd., Montreal, Canada, makers of plumbing supplies, died at Montreal June 3, 1931. Mr. Robertson was also president of the Kongdon Mining and Smelting Company, Ltd., and of the Robertson Lead Manufacturing Company, Ltd.

Wilbur S. McIntyre

Wilbur S. McIntyre, died recently, at the age of 64. Mr. McIntyre was founder and president of the Welland Iron and Brass Company, Welland, Ont., Can.

William H. Larimer

William H. Larimer, treasurer and director of the Armstrong Cork Company, Lancaster, Pa., died at that city June 20, 1931. He was fifty years old.

News of the Industry

Industrial and Financial Events

National Smelting Business Up

During the first six months of 1931, shipments of aluminum manufactured by The National Smelting Company of Cleveland exceeded the tonnage for the same period of 1930. Shipments for June of this year not only were greater than for the same month of a year ago, but were also in excess of shipments made in June 1929. This showing is interesting because it indicates what can be done even in hard times by intensive research and close application to a single product. The National Smelting Company still manufactures nothing but aluminum and its alloys. The improvement is attributed to the work that has been done by the National Research Laboratory, both prior to, and during this dull period. During 1930 and the first half of 1931 the appropriations for the Research Department were constantly increased, new equipment was added, and the personnel enhanced.

The result has been first, the development of numerous special mixtures, possessing unusual properties, and second, improvement in the quality of standard alloys by special smelting methods so as to give these alloys superior physical properties.

Brass Ingot Statistics

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of June, 1931, amounted to a total of 3,584 tons according to announcement made by the Institute, July 21, 1931. On July 1st, unfilled orders for brass and bronze ingots and billets on the books of the members amounted to a total of 22,706 net tons.

Average prices per pound received by the membership on Commercial Grades of six principal mixtures of ingot brass during the twenty-eight day period ending July 17, 1931 were: Commercial 80-10-10 (1 per cent Impurities), 9.40c; Commercial 78 per cent Metal, 7.572c; Commercial 81 per cent Metal, 7.870c; Commercial per cent Metal, 8.181c; Commercial 85-5-5-5, 8.438c; Commercial No. 1 Yellow Brass Ingot, 6.596c.

International Silver Company

The International Silver Company, Factory C in Bridgeport, will be closed as soon as "practicable" and the work done there transferred to other plants in Meriden, Wallingford, Waterbury, the company announced on July 3, 1931. The move is in line with the company's policy of concentrating all plants within a smaller radius of the Meriden headquarters and consolidating lines of similar character in one factory, the announcement said.

Several hundred employees at the Bridgeport factory will be re-employed at the other branches as needed, the company stated.

The Bridgeport factory is the former Holmes & Edwards Company, taken over by the International Silver Company in 1898.

Aluminum Company Sued by Baush

Suit for damages has been instituted in the United States District Court at New Haven, Conn., by the Baush Machine Tool Company, Springfield, Mass., against the Aluminum Company of America, Pittsburgh, Pa. The plaintiff charges the Aluminum Company with monopolistic practices in production and distribution of aluminum, and claims damages for injury to its business through price discriminations given by the Aluminum Company to subsidiaries competing with the plaintiff concern.

Aluminum Companies in Deal

The Aluminum Goods Manufacturing Company of Manitowoc on July 2, 1931, announced it had purchased a substantial interest in the Aluminum Company of Canada, Ltd., Toronto, and was organizing a new company to be known as Aluminum Goods, Ltd.

Winsted Insulated Wire Company

At a hearing in chambers on July 27 at the Waterbury, Conn., court house before Judge Arthur F. Ells, an order was given for sale of all assets of the Winsted Insulated Wire Company. The sale will be by public auction on August 17 at the plant on Main Street, Winsted. Ten per cent of the purchase must be paid in cash at the time of sale and the balance to be paid when the sale shall be legally and properly approved.

Judge H. H. Howd, temporary receiver, T. J. Barnes, a representative of the Hudson Wire Company of Ossining, N. Y., and the firm of Carmody & Thomas, representing the Winsted Gas Company, attended the hearing. There was no opposition to the sale. The property was recently inventoried at $36,000; the Hudson Wire is the largest creditor with a claim of $28,000.

Pressure Tank Explosion

A workman was killed and another injured, perhaps fatally, last month when the compression tank of a copper pressing machine exploded in the plant of the Tottenville Copper Company in Amboy Road, between Tottenville and Richmond Valley, Staten Island, N. Y.

The man killed was Hans Eneche, 42, of 41 Kreischer Street, Kreischerville, S. I. He was married and the father of four children The injured man, who is single, is Stephen Daein, 36, of 89 Cole Street, Richmond Valley. Physicians said his chances of recovery were slight.

Chromium Patent Suit

An infringement action has been brought, United Chromium, Incorporated of New York, Plaintiff vs. Chrysler Corporation of Detroit, Defendant. The Bill of Complaint in this action was filed July 7, 1931, in the Federal District Court at Wilmington, Delaware.

The Bill of Complaint charges the Chrysler Corporation with infringement of two patents owned by United Chromium, Inc. These patents are: U. S. Patent No. 1,581,188, issued to Colin G. Fink on April 20, 1926; U. S. Patent No. 1,802,463, issued to Colin G. Fink on April 28, 1931.

Winchester-Remington Merger Report

A press report from Waterbury, Conn., last month stated that the sale of the Winchester Repeating Arms Company, New Haven, to the Remington Arms Company was imminent. Consolidation of operations was said to be planned if the sale went through, but no location was given. It was also reported that the du Pont interests were negotiating for purchase of the Winchester company, which is in receivership.

Aluminum Plant Stops Ingot Making

Ingot producing operations at the plant of the Aluminum Company of America at Niagara Falls, N. Y., were suspended August 1, according to press reports, which stated that the action was probably necessitated by an accumulation of metal. No resumption date was announced.

American Brass Exhibit

The feature of the exhibit of the American Brass Company, Waterbury, Conn., at the National Metal Exposition will be demonstrations of oxy-acetylene welding with Tobin Bronze rods. The American Brass Company will occupy space C-131 at this thirteenth annual exposition, to be held on Commonwealth Pier, Boston, September 21st to 25th. Charles Gallo will have charge of the welding demonstrations and will instruct visitors in the

proper methods of oxy-acetylene welding with Tobin Bronze.

In addition to the demonstrations, there will be displayed an excellent collection of cast iron pieces that have been repair welded with Tobin Bronze filler rods.

Everdur Metal, a copper-silicon-manganese alloy, weldable by all methods, will be shown in sheet, wire, rod, tube and cast forms. There will also be a display of Everdur tanks constructed by automatic electric welding.

W. Harold Dowd, Exhibit Manager, will be in charge.

Tariff Changes

A summary of the completed tariff investigations made by the U. S. Tariff Commission and changes effected on articles involving non-ferrous metals and metal products, is given below.

Article	Rate of Duty: Act of 1922	Act of 1930	Proclaimed by President
Woven wire fencing and netting:			
Galvanized before weaving	40%	45%	50% (increase)
Galvanized after weaving	40%	45%	60% (increase)
Fourdrinier wire ..	30%	50%	75% (increase)
Cylinder wires, over 55 mesh	35% or 45%	50%	75% (increase)
Woven wire cloth, over 55 mesh suitable for manufacture of Fourdrinier or cylinder wire..	35% or 45%	50%	75% (increase)
Bells, bicycle, etc. ..	40%	50%	70% (increase)
Chimes	40%	40%	No change
Carillons	40%	20%	No change

Corporation Reports

Bohn Aluminum and Brass Corporation. Six months ended June 30: Net profit after charges and Federal taxes, $925,557, compared with $688,766 last year. Three months ended June 30: Net profit, $488,261, compared with $437,296 in preceding quarter and $293,380 in second quarter last year.

Reynolds Metals Company, Inc., and subsidiaries — Six months, ended June 27: Net profit after depreciation, interests, Federal taxes and other charges, $809,520, compared with $764,419 last year. Company declared quarterly dividend of 37½ cents, as against 50 cents paid previously.

General Refractories Company—Three months, ended June 30: Net income after interest, depreciation, depletion, Federal taxes and other charges, $35,591, compared with $269,203 in the preceding quarter, and $621,075 in the second quarter of 1930. Six months: Net income, $304,794, compared with $1,381,516 last year.

General Cable Corporation—Quarter ended June 30 net loss of $575,643 after interest, depreciation, etc., against $408,105 in June quarter of 1930. The six months ended June 30 showed a net loss of $1,273,608 against net loss of $895,358 in first half of 1930.

International Silver Company and Subsidiary—Three months ended June 30: Net loss after depreciation, $120,595, compared with a net loss of $148,947 in the preceding quarter and a net loss of $154,664 in the second quarter last year.

Hoskins Manufacturing Company—Six months ended June 30: Net profit after charges and Federal taxes, $138,128, equal to $1.15 a share on the capital stock, compared with $275,779, or $2.30 a share, last year.

Savage Arms Company announced a quarterly dividend of 25 cents a share on the common stock of Savage Arms, against 50 cents a share previously. The regular quarterly of $1.50 a share was declared on the second preferred stock. For the first half of 1931 the company suffered a loss of $160,579, against net loss of $52,662 last year.

National Lead Company declared a regular quarterly dividend of $1.25 per share on the common stock payable September to stock of record September 11th.

Developments in Metals

JAPAN USING MORE ALUMINUM FOIL.—Consumption of aluminum foil in Japan has been increasing recently and is now estimated at 30,000 to 35,000 lb. a month. While there are two makers in Japan at present, the Fukuda and Tokai Enken works, the Sumitomo Aluminum Company is planning to start producing in July, 1931.

CROMAL, A NEW LIGHT ALLOY is reported by the Metal Bulletin of London, England, to have been developed by a Swedish metallurgist, J. Harden, of the Stockholm Metallographic Institute. The inventor is said to have been able by means of a special patented process, to solve the problem of uniting aluminum with chromium. Chromal contains, besides aluminum, 2 to 4% of chromium and small quantities of nickel and manganese.

ALUMINUM STOCKS ARE INCREASING.—Stocks of aluminum in Europe and North America are estimated by German producers at 150,000 tons, the total production of about nine months. Stocks are reported to be showing further increases and German makers are considering reductions in price to bring aluminum into closer competition with copper, as an alternative to drastic curtailment of output.

CUT ZINC PRODUCTION.—The international zinc cartel meeting at Ostend, Belgium, has agreed to cut production 45 per cent from normal levels, effective from Aug. 1 to Dec. 31, 1932. The countries signing the agreement are Belgium, France, Germany, Poland, England, Norway, Czechoslovakia, Italy, Australia, Canada and Mexico.

ALUMINUM TANK CARS have been developed by General American Tank Car Corporation for transportation of acetic acid, glycerin, formaldehyde and other liquids which cannot be kept pure in contact with steel. Cars are of 8,000 gallons capacity.

ALUMINUM TRUCK TANKS of 5,000 gallons capacity are being constructed by Penn Furnace and Iron Company, Buffalo, N. Y., under Aluminum Company of America engineering direction, for mounting on a fleet of gasoline trucks for Emblem Oil Company of Warren, Pa.

NINE HUNDRED TONS OF COPPER was purchased last month by the United States Navy Department from the following bidders: American Metal Company, 350,000 lbs.; International Minerals and Metals Corporation, 276,000 lbs.; Lewin Metals Corporation, 665,000 lbs.; American Smelting and Refining Company, 500,000 lbs. Prices paid ranged from 7.69c. to 8.45c.; deliveries were to Atlantic, Gulf and Pacific ports.

A SILVER BASIS for Mexican currency is planned by that country, according to press reports, which stated, however, that coinage would be limited and purchases of new metal would probably be unnecessary. Internal payments in silver are now acceptable, it is stated.

EUROPEAN ARMS AND ARMOR, with many fine examples of metal work, are on view at the Metropolitan Museum of Art, New York City, in a special loan exhibition opened to the public August 3.

AN ALUMINUM SLEEPING CAR is being constructed by the Pullman Company at Chicago, Ill. It is expected to weigh from 25 per cent to 40 per cent less than a similar steel car.

METALLIC CADMIUM production in the United States in 1930 was 2,777,762 pounds, valued at $1,777,768, according to the Department of Commerce. This is a new high, exceeding 1929 output by 12%.

PLATINUM AND ALLIED METALS (new) recovered by refiners in United States in 1930 compared with 1929, according to Department of Commerce, as follows:

Year	Platinum	Palladium	Iridium	Osmiridium	Others	Total
	(In Troy Ounces)					
1929	41,760	5,295	302	364	256	47,977
1930	37,780	3,801	1,468	334	119	43,502

THALLIUM is one of the rare metals that has come into commercial use within recent years, according to the United States Bureau of Mines, Department of Commerce. Its comparative scarcity, combined with a resemblance to the common metal lead, have retarded the development of uses for thallium. Although production is still measured in pounds rather than in tons, it is now finding application in a number of fields. Its most important use is as a poison for rats and ants.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

AUGUST 1, 1931.

Trusound Corporation of America, a subsidiary of the Trusound Corporation of London, has leased the part of the **Bristol Company** plant formerly occupied by the William Bristol Talking Picture Company and will start the manufacture of gramophone parts there shortly. The concern expects to be employing 150 men before fall.

That local brass industries have passed their lowest point and are on the upgrade is seen from the fact that **Scovill Manufacturing Company** stock, which a few months ago was selling at around $25 is now selling at $32 to $35.

Waterbury Clock Company closed its plant for a week and a half around the Fourth of July; the **Chase Companies** shut down for four days; **International Silver Company** shut down for two weeks; and the **Scovill Manufacturing Company, American Brass Company, Waterbury Buckle Company,** and **Lux Clock Company** for only one day. **Waterbury-Farrel Foundry Company** operated on the Fourth the same as other days.

Waterbury has 17 firms making parts for airplanes, according to the report of the State Chamber of Commerce, the firms being as follows: **American Brass Company,** aluminum bronze for motors; **American Sheet Metal Works,** gasoline tanks; **Beardsley and Wolcott Company,** Campbell nibbling machine for cutting metal for plane bodies; **Chase Companies,** copper tubing for gas and oil lines; **Draher Machine Company,** machine parts; **French Manufacturing Company,** tubing for radiators, gas and oil lines, aluminum tubes covering ignition lines; **Manufacturers Foundry, Inc.,** blocks for airplane motors, castings, and special motor parts, cylinder blocks; **Mattatuck Manufacturing Company,** metal parts, screws, springs, wire forms; **Probst Manufacturing Company,** rivets, copper, nickel, steel, zinc; **Rowbottom Machine Company,** parts for airplane engines, cams, valves and control parts; **Scovill Manufacturing Company,** screws, brass rods and parts; **Thinsheet Metals Company,** shim brass, diaphragm nickel silver, radiator brass; **Waterbury Battery Company,** batteries; **Waterbury Clock Company,** watches; **Waterbury-Farrel Foundry Company,** machinery for making screws for planes; **Waterbury Tool Company,** speed gears, winches for drawing dirigibles to mast; **A. H. Wells Company,** brass and copper tubing.

Patents were granted local inventors last month as follows: **Daniel F. Dalton,** fastening device, assigned to **Shoe Hardware Company; Abram N. Pasman,** flush valve, assigned to the **Scovill Manufacturing Company; Elton A. Pope,** laundry tray faucet, assigned to the **Chase Companies; William Selby,** toy bank and vending machine, assigned to the **Waterbury Button Company.**

W. R. B.

Connecticut Notes

AUGUST 1, 1931.

BRIDGEPORT—The directors of the **Bridgeport Brass Company** have elected **Ernest S. McClary** as secretary and treasurer to fill the vacancy caused by the resignation of **George T. Wigmore. Selwyn Bywater** was elected director to fill Mr. Wigmore's place on the board. **Leonard M. Allen** was elected assistant treasurer and **William R. Breetz** was elected assistant secretary.

International Silver Company is closing the Holmes and Edwards plants here and will transfer the work to its other plants in Meriden, Wallingford and Waterbury. The company intends to concentrate all its plants within a smaller radius around the Meriden headquarters. Several hundred employes of the local factory will be reemployed at the other factories as needed.

Bridgeport Chain Company receiver has been unable to locate six preferred stockholders of the company and has asked the court for instructions as to the disposal of $1,597 due them. They are Daniel O. Perkins, Alice Pierce, Clarence J. Reed, William Stedman, C. W. Rowell and Mae Thompson.

Underwood-Elliot Fisher plant here is entering its sixth month of full time operations in the manufacture of portable typewriters. Production for Christmas trade is expected to offset the normal seasonal decline.

BRISTOL—The **E. Ingraham Company** is developing a line of electric clock models and expects to engage in the manufacture of motors to be used in the clocks.

NEW BRITAIN—The **Stanley Works** is manufacturing the so-called "electric eye" invented by **Horace H. Raymond** of this city, which automatically opens doors. The company makes the doors, to which the "electric eye" is attached. They have been installed in the company's own plant, and in various buildings here and in New Haven. They are particularly adaptable to restaurants.

The Stanley Works and the **Stanley Rule and Level Company** were closed for two weeks during the middle of last month.

WINSTED—Sale of all the assets of the **Winsted Insulated Wire Company** was ordered by Judge A. F. Ells last month. (See page 365.)

Strand and Sweet Wire Company, branch of the **Polymet Manufacturing Company,** was closed for two weeks, reopening July 13. It has been operating twelve machines for several months, which is about 25 per cent of its capacity. The twelve are operated 24 hours a day.

HARTFORD—Miscellaneous corporations in Connecticut will pay the state this year $1,380,844 as the net income tax on corporations. This is about one-third of the tax paid the previous year, which was about $3,500,000. The net earnings of these corporations amounted to $65,700,700 compared with $172,100,000 the previous year.

Pratt and Whitney Company's contract for special automotive machinery from General Motors has been received and will necessitate organization of a night force to meet production requirements.

TORRINGTON—Four concerns here manufacture parts used in airplane construction, the State Chamber of Commerce reports. They are **Fitzgerald Manufacturing Company,** gaskets and shims; **Progressive Manufacturing Company,** screws and rivets; **Torrington Company,** spokes and nipples; **Turner and Seymour Manufacturing Company,** escutcheon pins.

Eric L. Stowe has been promoted to the position of mechanical supervisor of the local **American Brass Company** plant to succeed the late **Charles E. Bennett.** He has been with the company 30 years. **Randall Gerrard** has succeeded Mr. Stowe as maintenance engineer.

TERRYVILLE—**Eagle Lock Company** has declared the regular quarterly dividend of 75 cents a share, payable July 15. The company was shut down for two weeks last month for inventory and repairs. It has recently engaged several efficiency engineers to make a survey of the plant to effect economies and better production.

ANSONIA—**The American Brass Company's** $3,000,000 building program here will be divided over a term of years, it is now said. Work now undertaken will entail the expenditure of $600,000 this year and $1,250,000 in 1932. The balance will be spent in 1933.

Charles H. Jockmus, former head of the **Ansonia Manufacturing Company,** who died recently left an estate of $2,000,000. Each employe of the company was left a bequest as follows: Hugh Pendlebury, $10,000; **Julia McCormack,** George Ward, Mary Parker, $5,000 each; Walter Armstrong and Alexander Whylie, $2,500 each; Florence Nordstrom, William Noadler,

Carl Johnson, Albert Edwards, Timothy Crowley, Edward Dolan and Catherine Murphy, $1,000 each; to each other employe of the company, $500.

MERIDEN—**The International Silver Company** is abandoning the company's pension system and is working up a co-operative pension plan to substitute for it.

MIDDLETOWN—**The Russell Manufacturing Company** has elected **Fred W. Shibley,** vice-president of the Bankers Trust Company of New York, one of its directors. The company has appointed **Harry W. Kelsey** purchasing agent, and **Walter T. Palmer** has been named to succeed Mr. Kelsey as manager of the replacement sales division. It reports an increase of 47 per cent in the sale of its products during the period March 25 to June 12.

NEW LONDON—**The Electric Boat Company** has received notice from the Navy Department that its bid for the construction of a new submarine to be built at New London has been accepted. Plant changes will be started at once so that work on the sub may be undertaken as soon as possible.

THOMASTON—Most departments of the **Seth Thomas Clock Company** are now on a 45-hour week schedule. For some time they were working only 32 hours a week.

COLLINSVILLE—The directors of the **Collins Company** have declared the regular dividend of $1 a share, payable July 15. W. R. B.

Rhode Island Notes

AUGUST 1, 1931.

The unemployment situation in this usually active industrial community is becoming a serious one, and while operations in the various branches of the metal trades have from the beginning of the year been at the lowest ebb in many years, it was surprising how few of the several hundred who applied to the local emergency bureau for employment on odd jobs and conservation work at $15 per week gave their occupation as metal workers in any branch of the industry. The branches of the manufacturing jewelry industry continue dull, many factories being entirely closed down. And at the present time, when the vanguard of buyers for fall and holiday goods should be putting in an appearance to look over the various lines, there is nothing in sight. Among the building trades there is a slight improvement as a number of projects that have been hanging fire have been set in motion. July closed with a generally more optimistic tendency than at its opening and everyone still hopes for a gradual rehabilitation of manufacturing and industrial pursuits.

The industrial and economic depression of the past year is sharply reflected in materially reduced assessment upon the corporate excess of the manufacturing, mercantile and miscellaneous corporations of the State as shown by the annual report of the State Board of Tax Commissioners which was made public the past week. The total assessment for 1931 is $1,801,309 as compared to $1,995,640.42 in 1930, a drop of $194,331. Forty-one corporations identified with the metal trades having a corporate excess of $100,000 or more, represent a total corporate excess this amounting to $22,224,299.79 upon which they are assessed a total tax of $88,885.54. Forty-one metal concerns were listed.

Ralph Ring Company, Inc., 36 Garnet Street, Providence, has been succeeded by the **Artel Jewelry Manufacturing Company.**

Thornton Brothers Company, Inc., manufacturing jewelers, 43 Hospital Street, Providence, has filed a voluntary petition in bankruptcy in the United States District Court; assets scheduled at $10,528 and liabilities $33,756.

Schwarzkopf and Walker, Inc., Providence, has been incorporated to manufacture jewelry with a capital stock of 100 shares of common no par value. The incorporators are **Walter J. Hennessey, Joseph Jonas** and **Katherine Gliniak.**

Doris Manufacturing Company, Inc., has been incorporated by **Seymour Guthman** of New York City, **Jacob S. Rabinowitz** and **Samuel H. Workman,** both of Providence, to conduct a manufacturing jewelry business; capital stock, 300 shares of no par value common stock.

Andrew Schwartz, formerly connected with **Barnett Daniel and Company,** has taken a partnership interest in **The B and O Chain Company, Inc.,** and the plant is being removed from 91 Sabin Street to larger quarters at 158 Pine Street.

At the recent meeting of the **Providence-Attleboro Branch** of the **American Electroplaters' Society, G. S. Benson,** assistant manager of the Ansonia branch of the **Anaconda Copper Company,** showed moving pictures of the processes of mining and manufacturing copper and brass, paying particular attention to the manufacture of the anodes used in electroplating processes.

Reginald W. Hobson of the **Gorham Manufacturing Company** was re-elected president of the **Industrial Relations Association** of Rhode Island at the annual meeting held early the past month at Rocky Point. Members voted to continue during the coming year the foremen's gatherings in connection with the Association's monthly meetings. W. H. M.

Middle Atlantic States

Central New York

AUGUST 1, 1931.

Trade in the non-ferrous metal industries of Central New York moved sluggishly during July with promise held out that the currents of commerce in some quarters will be accelerated in the near future.

Efforts to get business through the manufacture of a new product and through the reduction of prices was noted in the past month in two of the leading upstate firms.

From Ilion, N. Y., came the report that introduction within a few months, of a new Remington noiseless portable typewriter is expected to increase earnings of **Remington-Rand, Inc.** The portable is a product of the Stamford, Conn., laboratory of the corporation.

James H. Rand, Jr., was elected president of Remington-Rand, Inc., to succeed **W. F. Merrill** at the reorganization meeting held in New York, July 15. Mr. Rand continues as chairman of the board. The number of directors was increased by one. **H. J. Fuller** who had previously resigned as a director is filling the new place on the board.

Through national advertising **Oneida Community, Ltd.,** announced the reduction of prices on some of its products anticipating that this would stimulate business activity in their line.

An encouraging note was sounded in Earlville, where the **Spicer Machine Company** is operating a day and night force because of larger orders. The firm has a large order for golf tees, a patent of Lola Lee, Sherrill, which is reported to be meeting with favor throughout the country. The tee is shaped out of soft copper wire in a machine designed by Mr. Spicer. The order calls for 150,000 tees a day.

A new type of bronze store front is being installed in the Central New York area by **S. Ciocca and Company** leaders here in metallic store front business. They report the bronze fronts are selling better than copper ones. Recent installations of the bronze fronts have been made in Utica, in a large department store in Lowville, and stores in Frankfort, Boonville, and Herkimer.—E. K. B.

Newark, N. J.

AUGUST 1, 1931.

The **Krebs Pigment & Color Corporation,** a new company to be launched by the **duPont Company** and **Commercial Solvents** interests will be located at Newark. The new company will be a consolidation of the lithopone and dry color business of the **Krebs Pigment and Color Company** and **Grasselli Chemical Company** with the titanium pigment business of the **Commercial Pigments Company.** Like the duPont organization, the Commercial Solvents Corporation is dependent on the automobile industry for a large part of its business, about 25 per cent of its activity being concerned with the automo-

tive trade and the balance being concerned with the paint, lacquer, film, leather, textile and chemical process industries. **Carl H. Rupprecht,** now manager of the pigment and dry color division of the Grasselli Company, will be president of the new company and the main office will be here.

The **Karl Oswald Company,** 324 Ferry Street, metal goods manufacturers, was badly damaged by flames recently.

Duro Radio Tube, Inc., Newark, has been chartered with $100,000 capital to manufacture radio tubes. **V. A. S. Corporation,** Newark, will manufacture electrical supplies.—C. A. L.

Trenton, N. J.

AUGUST 1, 1931.

Business has shown some improvement at some of the Trenton metal plants during the past month. The **J. L. Mott Company,** which was practically closed, is now operating a few days a week in the different departments. The **John A. Roebling's Sons Company** has also increased working hours.

Harry F. Porter of Trenton has been granted three separate patent awards from the patent office at Washington, D. C., for as many inventions involving alloys. One of Porter's inventions is a magnetic alloy, made up of copper, nickel and iron; another is a method of simultaneously producing and refining the same alloy, while the third is a magnetic device.

The Spicer Manufacturing Corporation's plant at Plainfield, N. J., which had been operated with a greatly reduced force of about 100, has been closed. It is said to be doubtful whether it will be reopened. Two other plants of the concern are in operation at Pottstown, Pa., and Toledo, O. Some time ago several other concerns were merged with the Spicer corporation, some of which were sold afterward and others absorbed into the main plant at Toledo. During the World War a force of more than 1,600 men were employed at the Plainfield plant.

Following concerns were incorporated here: **Fischer Foundry Company,** 1,000 shares no par; **Middlesex Utility Products Company,** manufacture electrical devices, 2,500 shares common, Elizabeth; **Insulyte, Inc.,** manufacture electrical devices, $200,000, Hillside; **Nassau Laboratories,** chemicals, $200,000, Jersey City; **Deubel Studios, Inc.,** manufacture clocks and watches, $100,000, Jersey City; **Puget Chemical Company,** $50,000 preferred, 4,000 shares common, Jersey City.—C. A. L.

Middle Western States

Detroit, Michigan

AUGUST 1, 1931.

It is the mid-summer dull period for all lines of manufacturing in this area. The brass, copper and aluminum working industries are at present showing extremely curtailed production. Outside of demand from the automobile industry, which also has slowed up materially, there is very little activity. Manufacturers of plumbers' and steam fitters' supplies have been producing very little. Some of these plants are operating part time and others are practically at a standstill. Manufacturing jewelers are almost at a standstill, with nothing very promising in sight.

No improvement is expected in any branch of the nonferrous metal industry until the fall. At that time the motor car plants probably will become more active. At least that has been the rule in the past. But no one is expecting a rush even then. Everything points to a slow revival of fall business.

The plating industry is following about the same trend as other lines. At present it is quiet, with most of the plants engaged only part of the time.

Detroit Ornamental Foundry Company was recently incorporated for the purpose of manufacturing metal castings. The capital stock is $20,000 and the owners are **Martin A. Miller, Emil G. Freeberg** and **Michael Syzdek.**

Sales of Copeland refrigeration units for the past eight months increased more than 63 per cent over the corresponding period of the previous fiscal year, according to **W. D. McElhinny,** vice-president of **Copeland Products, Inc.,** at Mt. Clemens, Mich.

Polished chromium plated spokes are now regular equipment in all wheel models of the Graham line cars, except the low-priced Prosperity Six. This is further evidence that chromium plating is steadily on the increase in the motor car industry. The Graham-Paige is one of the larger automobile organizations that is maintaining substantial summer production.

Bohn Aluminum and Brass Corporation is expected to show increased earnings for the first half of 1931 over the corresponding period in 1930. This concern has been unusually favored with business over a long period.

Negotiations have been completed with the **Independent Gas Cock Company,** Jonesville, Mich., to move to Port Huron and utilize a plant formerly occupied by another concern. The Jonesville organization manufactures high grade forged brass gas cocks. President of the company is **G. Nelson Smith,** St. Louis, Mo.

Norge Corporation, Detroit, electric refrigerator manufacturing division of the **Borg-Warner Company,** for the past six months has shown a 480 per cent sales increase over the same period of 1930. Figures for June show a 371 per cent gain over the same month of a year ago.—F. J. H.

Wisconsin Notes

AUGUST 1, 1931.

Aluminum Goods Manufacturing Company of Manitowoc, has announced the purchase of "a substantial" interest in the **Aluminum Company of Canada, Ltd.,** Toronto, Ont., and is organizing a new company to be known there as **Aluminum Goods, Ltd.,** of which **C. M. Salter** will be president.

A. J. Vits, H. L. Vits and **George Vits,** officers of the Manitowoc company, will be members of the board of directors of the new Canadian firm, with **George Vits** as chairman of the board of directors. He is president of the Manitowoc concern. The firm will engage in the manufacture of aluminum kitchen ware on an extensive scale for Canadian consumption.

A. P. N.

Other Countries

Birmingham, England

JULY 20, 1931.

The extension which has been made at the works of **Smith & Davis Ltd.,** one of the best known brassfounders in the Birmingham district have approximately doubled the area of the premises. The most up-to-date processes have been installed in all departments including ingenious machines produced in the Company's works which make completed chandelier chain from brass strip. In the lacquering department a modern fume exhausting plant has been installed. In the hinge shop solid drawn hinges are cut from the bar and then gapped, assembled, drilled, wired up and sanded. Curtain rails are scratch brushed and automatically wrapped up and other machines make runner loops. This company makes a very large variety of products by machine for the building, plumbing, gasfitting, cabinet and general furnishing trades.

The British metal market has improved in tone consider-

erably as the result of the settlement in regard to the Hoover debt moratoruim. There have been substantial gains in all metals and while the actual business placed has not been large it has been sufficient to impart a better tone in the non-ferrous metal industry of the Midlands. Some metal rollers have booked some small orders with Canada and there is great satisfaction with the fact that the debt negotiations came at an opportune moment when nothing seemed to be able to stem the collapse of copper, tin and spelter.

At the annual meeting of the **Broughton Copper Company, Ltd.** in Manchester the policy of the Copper Exporters Association was criticized by the **Chairman, Leonard Summer.** The Association, he said had throughout the year adopted the same policy as in the previous year. Whenever there was a slight buying movement they limited the quantity they were prepared to sell. They had hurt themselves considerably and in the process had also injured his Company. If the Association had followed the market and allowed the laws of supply and demand to function prices would have adjusted themselves and his Company's results would have been quite different. The copper situation was full of gravity. Like many other commodities it had fallen below the cost of production for many producers, Mr. Summer told the shareholders of the Broughton company.

The demand for builders' and plumbers' brassfoundry has increased recently owing to the fine weather and the opportunity of pushing ahead with building schemes. Houses are being erected at a fairly good pace on the outskirts of the large towns and provision has to be made in all cases for new shopping centers. Metals are being used increasingly in the shopfitting industry not only on new work but in the reconstruction of old premises.—J. H.

Business Items — Verified

Oil City Brass Works, 326 Neches Street, Beaumont, Tex., makes brass and aluminum castings and operates machine and pattern shops.

Aurora Metal Company, Inc., 614 West Park Avenue, Aurora, Ill., is producing aluminum bronze die castings from customers' blueprints.

Sunbeam Electrical Manufacturing Company, Evansville, Ind., is receiving bids for an addition to its machine shop. Estimated cost $40,000.

Roessler and Hasslacher Chemical Company, Inc., has moved its main sale office from 10 E. 40th Street, New York, to 350 5th Avenue, New York City.

Adelaide Brass Works, Linden and Fourth Streets, Allentown, Pa., has not discontinued business, says L. T. Bechtel, denying press reports to the contrary. Company operates a non-ferrous foundry.

Aetna Machine Works, 2036-44 Dommick Street, Chicago, Ill., formerly **Lewis J. Brainard and Sons,** and prior to that change the **American Die Casting Company,** make die castings; also maintain a machine shop.

Union Iron Works, 1243—24th Street, N. W., Washington, D. C., established 1841, operates a foundry, machine shop, structural shop and pattern shop. The company manufactures aluminum and gray iron castings.

Cogswell Manufacturing Company, 142 Norman Street, West Springfield, Mass., operates a brass, bronze and aluminum foundry, machine and pattern shops, and stamping, plating, polishing and grinding departments.

Lawrenceville Bronze Company, with offices formerly located in the Fulton Building, Pittsburgh, Pa., has moved its offices to 401 Bessemer Building. This firm operates the following departments; brass and bronze foundry.

Berkman Brothers, 37 Montrose Avenue, Brooklyn, N. Y., have established a complete and modern plating and lacquering plant at above address. This firm is operated by **Herman Berkman** and **Irving Berkman,** both formerly with **Brust Brothers, Inc.**

Fewlass-Leen Brass and Iron Company, 215 Pike Street, Cincinnati, Ohio, manufactures brass and aluminum castings and maintains a machine shop. The following departments are operated: brass, bronze and aluminum foundry, brass machine shop, casting shop.

Rubenstein Brothers, 71 Craig Street, West, Montreal, Que., Can., manufactures brass and aluminum castings. The following departments are operated: brass, bronze and aluminum foundry; brass machine shop, zincing, tinning, soldering, plating, polishing, grinding room, lacquering.

Industrial Research Laboratories, 1740 Standard Avenue, Glendale, Cal., have taken over the plant formerly operated by the **G. and F. Metal Products Company,** manufacturer of brass and aluminum castings. Company operates non-ferrous foundry, machine and casting shops, and plating and polishing departments.

Newark Wire Cloth Company, 351-365 Verona Avenue, Newark, N. J., manufacturers of wire cloth for every service, announces the appointment of **The Pacific Metals Company, Ltd.,** as west coast representatives. This well known concern in the west will carry a limited stock both in Los Angeles and San Francisco.

Fisher Brass Company, Marysville, Ohio, has filed a voluntary petition in bankruptcy. The firm has plants at Marysville, Bellefontaine and Delaware, Ohio. It is expected that the plants will continue operation. Company produces plumbers' hardware and was severely struck by the building depression which began in 1929, it is reported. **S. L. Fisher** is general manager.

Quality Alloy Casting Company, Easton, Pa., recently was sold and has changed its name to the **Custom Casting Company.** The company specializes in aluminum, brass and bronze castings. **George M. Douthett** is president. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop.

Delco-Remy Corporation, Anderson, Ind., which two years ago purchased the **Butler Manufacturing Company,** Indianapolis, Ind., makers of aluminum pistons, have moved the Butler plant's operations to Anderson. The Butler plant was known as the "Bu-nite" piston plant. It operates, in addition to its foundry, a machine shop, pattern shop and laboratory. Personnel remains practically unchanged.

Vanadium Metals Company, established in 1910 at East Braintree, Mass., and which removed to Groton, Conn., in 1911, is reported to be operating its brass, bronze and aluminum foundry, built in 1929, full time, producing a line of high grade castings. **J. R. Flannery,** son of the late founder of the American Vanadium Company, founded the concern and is still president; **G. H. R. Lowery** is general manager.

Magnus Chemical Company, Inc., Garwood, N. J., announces that it has appointed **O. W. Hoster** as its industrial representative for western Massachusetts. Mr. Hoster has been a specialist in the field of industrial cleaning for a long period of years and is well known in his present territory. **Willis L. Orton** has been appointed the Magnus industrial representative for Oklahoma and Texas. He will have headquarters at Tulsa, Okla.

Federal Abrasives Company, division of the **Swann Corporation,** has completed betterments and increased the capacity of its abrasive plant at Anniston, Ala. Besides an addition to the electric furnace plant, improved special equipment, the result of a long development period, has been installed in the aluminous grain finishing department. This improved equipment is designed to regulate within close analytical limits the fracture of regular aluminous grain.

United States Reduction Company, East Chicago, Indiana, recently completed a new building for the special production of virgin aluminum alloys. This building consists of 6,300 square feet of substantial iron construction, equipped with special furnaces as designed by their Research Department for the alloying of virgin aluminum. Plans are now under way to construct another building electrically equipped for the production of alloys required by the aircraft industry.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Company of New York, Inc.

AUGUST 1, 1931.

The month of July is behind us and we are that much nearer to the fall pick-up, if and when it comes. Business in July took a falling off which was as expected. However, during the closing week of July it was gratifying to note that both the number of orders and the volume of business increased. As pointed out repeatedly, the stocks of manufacturers, jobbers, retailers and all others except the producers are extremely low, and in the event of any revival of extended proportions it may not be so easy to get all of one's requirements at once. To be sure, there are large stocks of copper but they are all in the hands of the producer. At least half of this 400,000-odd tons of refined copper should right now be in the hands of the manufacturer, jobber, etc., as fabricated material. If such were the case, the stocks of refined copper would be just normal, considering the rate of consumption during the past five years.

The price of copper and of other metals and commodities (excepting wheat) are not falling any more, and there is every reason to believe that we are on the bottom and dragging along there. As is always the case when the pick-up comes, it is anticipated that it will be very sudden and it would not be surprising to see a sudden rise in the price of copper from present levels to 10c. and then ultimately 11c. Everyone can be certain that the price of copper is not going to remain below the average cost of production forever.

Last month a sentence in this article asked the question, "Why not buy your requirements now while the price of copper is so far below the average cost production?" Due to a typographical error this sentence was misprinted. However, you are again asked, "Why not buy?" You are not going to get copper and its products at a very much lower price than at present, and it looks as if it might go higher rather than lower. Certainly producers are not anxious to sell at present prices.

Monel metal business has maintained itself fairly well, although even this slipped some during the month of July, but also had the come-back during the last week of the month. Nickel sales are fair, but as the demand for stainless steel products has eased somewhat this is naturally reflected in nickel sales.

The aluminum business, too, fell off somewhat early in the month but is again on the mend.

As a matter of fact, what we are experiencing or have just had, is a taste of summer dullness which normally should continue through the summer months. It would seem that we ought to have a good pick-up even before the fall comes along. It is noted that the cotton mills of New England are working to capacity, and other business is picking up. Just recently a gentleman returning after a year's absence in South America remarked, "There is no depression; it is purely a mental condition; there is plenty of money and everybody seems to be going along more or less normally. Sooner or later people are going to buy, and then—there will be no more depression-minded folks." It looks very much as if this just about hits the nail on the head at this time—don't wait too long for a depression to end that is all over long since.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

AUGUST 1, 1931.

Recent buying of copper was not so aggressive as in June, as there was little in the situation to stimulate large volume orders. Delay in the adjustment of European financial and political problems was a deterrent factor to the display of market strength and consistent activity. The June statistics were obviously unfavorable reflecting continued overproduction which demand is unable to absorb. There was a price loss of three-quarters of a cent per pound during the first half of July, the market receding from 8½ to 7¾ cents. The total loss from the June high level was a full cent per pound. During the second half of July a fraction of the loss had been retracted, with a recovery to 8 cents for domestic delivery.

Foreign demand was slow early in the month, but improved moderately as the result of two price reductions, both of which occurred in the second week. The highest export quotation in July was 9.02½ cents c.i.f. European ports and the lowest 8¼ cents, the latter being the price since July 11. This year has been conspicuous for the most incisive and drastic price-cutting movements in the history of copper. The piling up of surplus stocks of refined copper to the extent of 826,948,000 pounds on July 1 reflects a radical dislocation between supply and demand. Some further curtailment in production is proposed but the restrictions are too minor to offset the crisis. A complete shut down of a half dozen of the big operators would prove a wise and in the end a profitable policy. However, the contrary opinion is apparently held by some producers who have not merely refrained from reducing production but have actually, in some cases, increased it. At this writing the market is back again to 7¾ cents, with an easier undertone.

ZINC

There was a slight market improvement in price of zinc last month, but the minor recovery was lost when the quotation for prime western receded to 3.90 cents East St. Louis. Recent demand was dull, but there are indications that curtailment plans will eventually improve the position of zinc. Stocks of slab zinc decreased 4,121 tons in June, and domestic production dropped to 23,483 tons. This is the smallest monthly output in nine years.

TIN

Conditions in tin were sensitive and erratic lately owing to a combination of circumstances including the tense foreign situation. Trading early in July was moderately active at 25⅝ to 26¾ cents for prompt Straits tin. Operators in New York and London engaged in some large scale market commitments for nearby and future deliveries on the basis of close to the best quotations for the month. Consumers also were represented in the transactions to a substantial extent, the demand from this quarter showing fair activity on market reactions.

The wide potential market for tin is still located in London. Sales in that field during July were heavy, and on several occasions amounted to over 1,000 tons a day. Meanwhile in the domestic market trading is more quietly conducted. Local operators get their stimulating policy largely from the trend and situation abroad, but the activities here are less spectacular than in London. At the close of July the market showed a reactionary tendency and prompt Straits tin declined to 24½ cents. The low point for the month was 24 cents on July 15. Easier conditions prevailed near the month end, with offers of Straits tin at 24⅛ cents.

ALUMINUM

Nothing happened during the past month to change the price of primary aluminum. No local or international crisis, present or prospective, seems to affect basic conditions in aluminum. It is indeed remarkable how this market can maintain its static poise when the price status of almost every other commodity has recorded sharp price reductions. Remelted aluminum and even secondary lower grade material are steady, with little if any fluctuation in prices. Demand is relatively quiet owing to seasonal reductions in automotive and other industrial quarters.

LEAD

Trading in lead during July was less active than in June, but the price situation was maintained uninterruptedly at 4.40 cents New York basis. There has been a good outlet for nearby shipments and specifications for July and August deliveries were in large volume. Total tonnage booked in last two months fully justify the stability of market prices. Production and consumption have been brought into more sound balance lately, and the trade response to this development is reflected in the freedom with which consumers covered heavy requirements. Surplus stocks of refined lead in the United States were reduced 2,672 tons. These were still abnormally excessive, being 139,698 tons on July 1. Production in June, however, fell off 8,726 tons as compared with the figures for May. The June output was the lowest monthly production in recent years. Deliveries also increased, and altogether the lead situation has been working into a more favorable position.

ANTIMONY

The market for antimony opened steady on the basis of 7 cents for Chinese regular duty paid. There was narrowness in the price range and no trade stimulant to infuse activity. Spot stocks here appear to be in strong hands but despite that supposition the market eased off in the last half of July to 6¾ cents duty paid. Inquiry was confined to moderate quantities and the situation was without special feature. There was no pronounced selling pressure apparent, however, either for direct China account or for local interests.

QUICKSILVER

Inquiry for quicksilver was on a restricted scale, and prices were variously quoted from $83 to $88 per flask. Italian and Spanish output is to undergo a closer regulation, according to reports. The Italian industry has accumulated considerable stocks, but production in that country has been slowed down.

PLATINUM

There has been no important change in platinum quotations for several weeks. Inquiry is quiet, and refined platinum quotes $37.50 to $40 per ounce.

SILVER

American and European developments in the silver situation recently clearly indicate that the world crisis in this commodity is intimately and inseparably connected with international progress and prosperity. On that score it is projecting itself as of major importance to every nation in the world. The decline in value of silver has caused serious repercussions in China and tremendous losses in India. Mexico and South American countries also have felt the strain as prices have dropped to extremely low levels in world markets. It is gratifying to note that various phases of the silver problem will be discussed by representatives of 21 American republics in October at Washington, D. C. Special interest attaches to the report that Germany is expected to buy 1,000,000 kilograms of bar silver for the coinage of 500,000,000 coins authorized by the recent decree. India was a recent moderate buyer as was China, but latter country also operated as seller. Current price was fairly steady at 27¾ cents per ounce.

OLD METALS

The position of the scrap metals was one of considerable uncertainty and dullness owing to current unsettlement over the European situation. Appearance of renewed ease in new copper market tended to hold operations in check. Consumers both abroad and here were apathetic in view of the mid-summer dullness. Consumption was down to a minimum basis, but brisker conditions would speedily start a movement for substantial supplies. Holders are not inclined to offer much in the way of further concessions as prices are now down to abnormally low levels.

Daily Metal Prices for the Month of July, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	6	7	8	9	10	13	14	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	9.125	9.125	9.125	9.125	9.125	8.625	8.625	8.625	8.125	8.125	8.125	8.125	8.125
Electrolytic (f.a.s. N. Y.)	9.00	8.75	8.75	8.75	8.75	8.50	8.50	8.50	7.75	7.75	7.75	8.00	8.00
Casting (f.o.b. ref.)	8.25	8.25	8.25	8.25	8.25	7.875	7.875	7.875	7.50	7.50	7.50	7.75	7.75
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.90	4.00	4.00	4.00	3.95	3.85	3.85	3.85	3.90	3.90	3.90	3.90	3.90
Brass Special	4.00	4.10	4.10	4.10	4.05	3.95	3.95	3.95	4.00	4.00	4.00	4.00	4.00
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	25.625	26.125	26.75	26.375	26.00	25.375	25.10	25.65	25.10	24.70	24.20	24.80	25.25
Pig 99%	25.125	25.625	26.25	25.875	25.50	24.75	24.60	24.90	24.60	24.125	23.50	24.15	24.60
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.00	7.00	7.00	7.00	6.95	6.95	6.85	6.85	6.90	6.90	6.80	6.75	6.75
Silver c/oz. Troy Duty Free	29.125	29.25	29.75	29.375	29.375	28.625	28.375	28.50	27.875	28.00	28.125	28.25	27.875
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	20	21	22	23	24	27	28	29	30	31	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Del.)	8.125	8.125	8.125	8.125	8.125	8.125	8.125	8.125	8.125	8.125	9.125	8.125	8.190
Electrolytic (f.a.s. N. Y.)	8.00	8.00	8.00	8.00	8.00	8.00	7.75	7.75	7.75	7.75	9.00	7.75	8.163
Casting (f.o.b. ref.)	7.75	7.75	7.75	7.75	7.50	7.50	7.50	7.50	7.50	7.50	8.25	7.50	7.777
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.90	3.90	3.90	3.875	3.875	3.875	3.875	3.875	3.85	3.85	4.00	3.85	3.899
Brass Special	4.00	4.00	4.00	3.975	3.975	3.975	3.975	3.975	3.95	3.95	4.10	3.95	3.999
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	25.25	25.05	24.50	24.35	24.125	24.15	24.25	24.25	24.15	24.30	26.75	24.125	25.018
Pig 99%	24.625	24.50	23.875	23.80	23.60	23.55	23.75	23.75	23.70	23.75	26.25	23.50	24.457
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.75	6.75	6.75	6.75	6.75	6.70	6.70	6.70	6.65	6.65	7.00	6.65	...
Silver c/oz. Troy Duty Free	28.125	27.875	27.75	27.625	27.75	27.875	27.75	27.75	28.00	27.875	29.75	27.625	28.299
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

Metal Prices, August 3, 1931

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 8,125. Electrolytic, 7.50. Casting, 7.25.
Zinc: Prime Western, 3.85. Brass Special 3.95.
Tin: Straits, 24.45. Pig, 99%, 23.875.
Lead: 4.225. **Aluminum,** 23.30. **Antimony,** 6.65.
Nickel: Ingot, 35. Shot, 36. Elec. 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $92. **Bismuth,** $1.50
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price August 4), 28.125.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50 to $40.00.

INGOT METALS AND ALLOYS

		Duty
Brass Ingots, Yellow	6¼to 7½	45%
Brass Ingots, Red	7⅞to 9	45%
Bronze Ingots	9 to11	45%
Casting Aluminum Alloys	19 to22	4c lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	8 to11	45%
Manganese Bronze Forgings	30 to40	45%
Manganese Copper, 30%	18 to30	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	9¾to12	45%
Phosphor Copper, guaranteed 15%	12 to16	3c lb.
Phosphor Copper, guaranteed 10%	11 to15	3c lb.
Phosphor Tin, no guarantee	32 to45	Free
Silicon Copper, 10%	20 to40	45%
Iridium Platinum, 5%	$43.50	Free
Iridium Platinum, 10%	47.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	5½to 6	Free
New copper clippings	5½to 6	Free
Light copper	4¾to 5¼	Free
Heavy yellow brass	3⅛to 3⅜	Free
Light brass	2⅝to 2⅞	Free
No. 1 composition	4¾to 5¼	Free
Composition turnings	4½to 4¾	Free
Heavy soft lead	3¼to 3½	2⅛c. lb.
Old zinc	1⅜to 1⅝	1½c. lb.
New zinc clips	2⅛to 2⅜	1½c. lb.
Aluminum clips (new, soft)	13 to14	4c. lb.
Scrap aluminum, cast, mixed	3½to 4	4c. lb.
Scrap aluminum sheet (old)	9½to10½	4c. lb.
No. 1 pewter	14 to15	Free
Nickel anodes	22 to23	10%
Nickel sheet clips; rod ends (new)	24½to25½	10%
Monel scrap	6 to 9	3c. lb.

Wrought Metals and Alloys

Effective July 11, 1931

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled		2½c. lb.
Mill shipment	18⅞c.to19⅞c.	
From stock	19⅞c.to20⅞c.	
Bare wire	10¾c.to11¾c.	25%
Seamless tubing	21⅜c.to22⅜c.	7c. lb.
Soldering coppers:		45%
Lots of 300 lb. or more	17⅛c.	
100 to 300 lb.	17⅜c.	

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

	High Brass	Low Brass	Bronze	Duty
Sheet	16¼c.	17⅝c.	18¼c.	4c. lb.
Wire	16¾c.	18⅛c.	18¾c.	25%
Rod	13¾c.	17⅜c.	17¾c.	4c. lb.
Brazed tubing	25⅛c.		28⅞c.	12c. lb.
Open seam tubing	24¼c.		26¼c.	25%
Angles, channels	24¼c.		26¼c.	12c. lb.
Seamless tubing	21⅛c.	22c.	22⅞c.	8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	24c.	10% Quality	27½c.
15% Quality	26¼c.	15% Quality	31⅛c.
18% Quality	27½c.	18% Quality	34⅝c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)

Tobin Bronze Rod	18⅛c.
Muntz or Yellow Metal Sheathing (14"x48")	18¼c.
Muntz or Yellow Metal Plates	18¼c.
Muntz or Yellow Metal Rod	15⅜c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL, SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (August 4) 31¼c., Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, open casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks, jobbers' price	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	7.25	2⅜c. lb.
Cut Lead Sheet (base price)	7.50	2⅜c. lb.

BLOCK TIN SHEET

(Duty free.)

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices F. O. B. mill. (Duty free.)

Supply Prices, August 3, 1931

ANODES

Copper: Cast, Rolled, sheets, trimmed, Rolled, oval — Prices uncertain due to fluctuations in virgin metals
Brass: Cast — Prices uncertain due to fluctuations in virgin metals
Zinc: Cast ..... 10¾c. per lb.

Nickel: 90-92% ..... 44c. to 45c. per lb.
95-97% ..... 44c. to 47c. per lb.
99% ..... 46½c. to 49c. per lb.

Silver: Rolled silver anodes .999 fine were quoted August 4 from 28¾c. per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1″ to 2″	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11″ 20 ply 64/68 Unbleached	$19.47 to 20.28
14″ 20 ply 64/68 Unbleached	28.92 to 30.12
11″ 20 ply 80/92 Unbleached	24.35 to 25.36
14″ 20 ply 80/92 Unbleached	35.88 to 37.37
11″ 20 ply 84/92 Unbleached	34.17 to 35.59
14″ 20 ply 84/92 Unbleached	50.69 to 52.80
11″ 20 ply 80/84 Unbleached	31.32 to 32.63
14″ 20 ply 80/84 Unbleached	46.44 to 48.38

Sewed Pieced Buffs, per lb., bleached ..... 46c. to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Crystals	lb.	.07¾
Chromic, 75 to 400 lb. drums	lb.	.14¾-.20
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.15¾-.21¼
Denatured drums	gal.	.27-.33
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.04
Ammonium sulphate, tech., bbls.	lb.	.03½
Sulphocyanide	lb.	.36
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Cadmium oxide, 50 to 1,000 lbs.	lb.	.65
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.24
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½-.17½
Cyanide (100 lb. kgs.)	lb.	.41
Sulphate, bbls	lb.	.043-.0475
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar, bags	ton	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.24¾
Cyanide (fluctuating)	oz.	.32-.40
Nitrate, 100 ounce lots	oz.	.21½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Hyposulphite, kegs	lb.	.03½-.04
Nitrate, tech., bbls.	lb.	.03¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sodium Stannate	lb.	.23
Sulphocyanide	lb.	.32½-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.27
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½